

Effective Science Communication (Second Edition)

A practical guide to surviving as a scientist

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Chapter 7

Establishing an online presence

There was a time when people felt the Internet was another world, but now people realise it's a tool that we use in this world.

—Tim Berners-Lee

7.1 Introduction

The 21st century is a marvel of scientific invention and technological advancement, but arguably the greatest impact that any of this has had on society as a whole is the rapid development of the Internet—from a limited collection of static webpages used by a select few, to a ubiquitous entity that permeates almost every facet of our existence.

While it has its distractions and detractors, there is no denying that the Internet has helped to revolutionise the way in which science is conducted. We can now simultaneously share data and edit documents with colleagues from across the world, converse with them using video conferencing facilities, and instantly access millions of pages of peer-reviewed research. The Internet has also opened up a wealth of possibilities in a personal capacity, with people now able to share images, videos, and stories with friends and strangers at the click of a button or the touch of a screen.

With the Internet's capacity for sharing research and making instantaneous connections, it has become a professional necessity for scientists to develop and maintain a digital footprint. While this might at first seem onerous or daunting, establishing an effective online presence will help to broaden the ways in which you can both communicate and conduct science. This chapter has been written to provide useful advice on how to create a digital footprint that is catered to your needs, experiences, and expectations.

7.2 Blogs

One of the most straightforward and rewarding ways that you can start to build your digital footprint is by setting up a weblog, or ‘blog’. A blog is an online collection of writing, in which you can write about the results and implications of your research, reflect on a recent field campaign, or raise awareness of an issue that you think requires attention. Alternatively, you might want to write a review of a recent publication that you have read, or about the political state of affairs of science in a specific country. Blogs don’t just have to be words; you might decide instead that you want to share pictures from your research, or a time-lapsed video of a particularly impressive experiment. With so much to potentially share, first focus your message by asking yourself: what, why, and who? What do you want to say, why do you want to say it, and who do you want to say it to?

When determining what it is that you want to say, a sensible first step is to look at a selection of other science blogs to see what already exists. Many active researchers run individual blogs about their work and research, while blog networks such as Scientific American [1], and IFL Science [2] provide a platform for a range of scientists to share their stories. Reading these blogs, it quickly becomes apparent that the most successful blogs (in terms of both quality of content and readership) are those which have something new to say, and which say it in a strong and discernible voice. Much like when writing for a scientific journal (See chapter 2), there is no point in simply rewriting what has been done before. Equally there is little point in writing something that only a select few people in the world will understand.

Think carefully about your audience. Most science blogs tend to be written for a non-scientific audience, as doing so maximises their potential readership. It might be that you are aiming to reach a more scientific audience (e.g. other researchers in your field, or other scientists in general), but if this is the case then make sure you rationalise why this audience needs to be reached. If you are writing for a non-scientific audience, then give careful thought to any other commonalities that your audience may have. For example, if you are writing a blog about your research into environmental change, are you also targeting people who identify as nature lovers? Thinking carefully about the exact audience that you want to target (and why you want to specifically reach them) will help you to focus your blog accordingly.

Here are five tips for writing a successful blog:

1. **Keep it short.** Aim to keep your blog posts somewhere between 400 and 600 words. There may be instances that call for a more in-depth account, but this will almost certainly result in a smaller readership.
2. **Use a pyramid structure.** Start with the key message, and then provide the context and background. If there is not enough of a hook in the first two sentences, then people will be unlikely to read any further. These two sentences are also what will tend to appear on Internet search engines, so they need to be alluring. As shown in figure 7.1, this style of writing is almost the mirror image of what you would expect to use when writing an article for a scientific journal (see chapter 2).

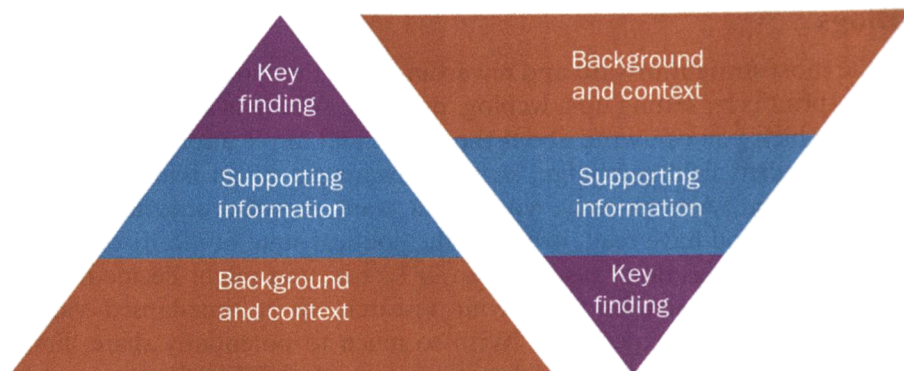


Figure 7.1. The typical structure of a blog (left) and a scientific journal article (right); the wider the section of the triangle the more content to be found in that section.

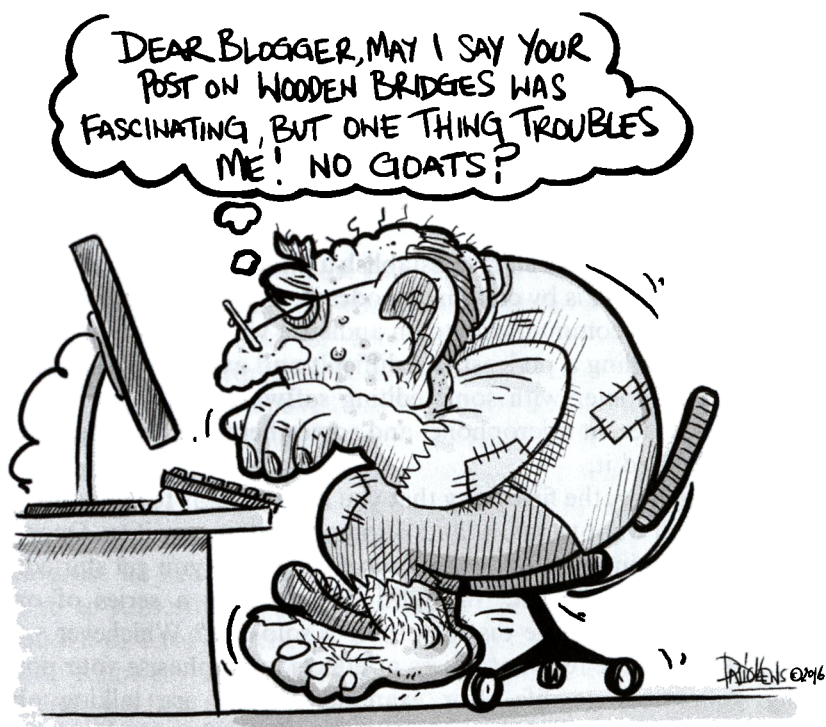
3. **Ask a non-scientist to read it.** When writing your first blog posts, get a friend or family member that doesn't have a scientific background to read your post, asking them to highlight any sections that they don't understand, or that require further explanation.
4. **Be original, and maybe even a little provocative.** Most people are looking to read something new, or a different take on something that they have seen before. Similarly, it might be more engaging for the reader if you also present your opinions or feelings (see chapter 4 for a discussion of pathos) alongside any scientific evidence, providing of course that you are willing and able to defend them should the need arise. If you do this, it is very important to be clear where science and opinion diverge.
5. **Post regularly.** Try to begin by writing one post every fortnight, increasing this to weekly (or more regular) posts once you have developed your confidence and style. People will be unlikely to keep checking your blog if you only update it every six months.

Once you have decided what you want to say, who you want to say it to, and how you are going to say it, you need to think about where you are going to host your site. There are a large number of websites that can host your blog, either for free or for an administration fee. When selecting which is best for you, spend some time reading a number of blogs across a variety of platforms to decide which most closely matches the ethos of your content. Two of the most popular blogging platforms are WordPress [3] and Tumblr [4], although there are many more for you to choose from. All of these sites provide comprehensive tutorials on the technicalities of setting up a blog, and there are also dedicated user groups within each community that can provide you with further technical support and assistance.

Interacting with other blog users, either on your blogging platform or across other blogging sites, will help you to attract followers and build a community. Similarly, if people interact with or post comments on your blog then try and respond to them in a punctual and engaging manner. Don't be afraid to defend you opinions, but as an

ethical scientist you should be prepared to admit if you have gotten something wrong.

You will probably have heard about Internet trolls—people who write defacing and inflammatory comments while often hiding behind a fake identity. If you encounter any trolls on your blog (which is more likely if you are writing about a contentious topic), then as the owner of the blog you have the ultimate control. Simply delete the comment without responding to it, and report the person who sent the comment to the administrative staff of your blogging platform, if it breaches their community guidelines. The best way to deal with bullies is to starve them of the attention that they may so desperately crave.



If you find the notion of writing a blog post on a weekly basis to be a daunting task, then consider writing as part of a collective group of bloggers. Either find some colleagues with whom you share a similar vision, or reach out and interact with communities that already exist, such as ScienceBlog [5] and the PLOS Blogs Network [6]. You might also consider writing a one-off piece and hosting it on a social journalism site. Medium [7] is one of the best known examples for this type of site, being an online publishing platform that effectively acts as a blog host where writers can upload their stories. One of the major benefits of using platforms such as Medium is that unlike a personal blog you don't have to work as hard build up your readership, as you potentially have access to readers from across the entire site. However, you still need to make sure that what you write looks interesting enough so that people click on your post to find out more.

Exercise: write a blog

Begin by sitting down and planning out exactly what it is that you want to say, and how you want to say it. Will you be writing blog posts that detail interesting aspects of your research, or do you want to showcase some of the exotic locations that you travel to on your fieldwork? Whatever it is, try to keep the theme sufficiently broad so that you will still have something to write about in six months' time.

After you have worked out the how and why of what you want to say, think about your target audience, and then go and have a look at some of the different blogging platforms. Which one works best for you? Try and plan three to five topics in advance, and follow the tips for writing a blog that are listed above; get involved with the blogging community, and respond to any comments in a timely fashion. Console yourself in the knowledge that your first few posts might not be particularly well written or well read, and that as with presenting (see chapter 4) both of these things will improve with time and practice.

7.3 Podcasts

Another way in which you can start to establish a digital footprint, or to build on the one that you already have, is by creating a podcast. A podcast is effectively an audio blog that allows you to communicate to an audience via the medium of sound. You might think that recording a podcast is a difficult and expensive process, but really all you need is a computer with some editing software (the majority of which is available for free), a decent microphone, and somewhere online to host the podcast once you have recorded it.

As with writing a blog, the first thing that you need to do is to determine what you want to say, why you want to say it, and who you want to say it to. Once you have these three things in mind the following steps should help you get started:

1. **Decide upon your format.** Will you be recording a series of one-to-one interviews, a round-table discussion, or a solo-cast? Whichever you decide upon, include some relevant noises or effects to emphasise your points or to bring your story to life. For example, if you are talking about the atmospheric effects of a recent rainstorm, then why not have some light rain playing in the background. Freesound [8] is a helpful resource for Creative Commons-licensed sounds that you can use in your podcast.
2. **Decide upon your recording and editing software.** It is worth experimenting with a few different toolkits until you find one that works best for you. Audacity® [9] comes highly recommended as a free piece of open source, cross-platform software that allows for professional recording, and which is very easy to set up and use.
3. **Find a good place to record.** If you are recording inside then make sure that you are in a quiet room that is free of noise, and where there are no possible distractions. Turn off all electronic devices that you are not using, and if you are recording using a computer, mute any email alerts etc, so that they do not interrupt the recording. If you are recording outside (e.g. at a field site), then

- try to find somewhere where the background noises will lend ambience to the piece, or aid in your communications. In all instances, try to record a few seconds of background noise (i.e. with no one speaking) at the beginning and end of your recording, as this will enable you to remove any distracting sounds (e.g. the background humming of lights) when editing the podcast.
4. **Get a good microphone.** A practical USB microphone (that you can plug directly into your computer) will typically cost between £50 and £100 at the time of writing. It is well worth the investment as it will help to ensure a more professional quality to your podcast. If you do many outside recordings or interviews in different locations then think about investing in a digital voice recorder. Alternatively, buy a lapel microphone that can be attached to your smartphone, and use a voice recording app.
 5. **Consider your transitions.** If the scenery change for a theatrical play is done in a heavy-handed and inconsiderate manner then it can really affect how the performance is received by the audience. The same goes for the transitions between different segments of your podcast. Carefully considered segues, as well as intro and outro music, can help to make the difference between a good podcast and a great one.
 6. **Decide where you want to host your podcast.** There are many free options for you to consider, some of which have premium options if you want to upgrade to more data or take advantage of marketing opportunities. Amongst the best are SoundCloud [10] and Podbean [11].
 7. **Get it listed.** Once you have found somewhere to host your podcast, you need to make sure that people can find it. In order to do this, you need to add it to a podcast directory. Arguably the biggest such directory is iTunes [12], but you should also add your podcast to Google Podcasts [13], Spotify [14], and Stitcher [15], thereby increasing the number of people that can find it.
 8. **Advertise it.** Tell your friends and colleagues about your podcast, and ask them to subscribe to it and to maybe leave a favourable review on their podcast directory of choice. Use your other social media platforms to keep your followers updated when you release a new episode, and consider including a link to the podcast in the signature of your email address.

Many other of the best practices of maintaining a blog also apply to managing a successful podcast, such as posting regularly and making sure that you become an active part of the user community, rather than someone who just posts audio recordings without any further interaction.

The following five podcasts are all useful examples of the medium, each one having excellent content, good production values, and a clear target audience. They have also been chosen because they cover a wide range of formats, from panel discussions to one-to-one interviews. They can all be found in various podcast directories, and listening to at least one episode from each of them will help you to decide which approach is likely to be the most suitable for you:

1. **Why Aren't You a Doctor Yet?** A podcast that mixes serious science and tech journalism with comedy and popular culture [16].

2. **Scientists not the Science.** A podcast that explores what it means to be a scientist [17].
3. **The Infinite Monkey Cage.** A podcast that presents a witty, irreverent look at the world through scientists' eyes [18].
4. **Radiolab.** A podcast that has been designed to make a wide range of incredible science stories accessible to broad audiences [19].
5. **The Poetry of Science.** A podcast that presents new scientific research through the medium of poetry [20].

7.4 Social media

Social media can be thought of as any web-based application or website that can be utilised to communicate with a network of people. Blogs and podcasts are a form of social media, and as has been outlined above there is a large variety in the different platforms that are available within each of these spheres; for example, WordPress, Tumblr, SoundCloud, etc. In addition to these, there are also a number of other social media platforms that could and should be utilised in order to help promote, and in some cases advance, your scientific research.

New social media platforms arrive on an almost weekly basis, with the popularity of such platforms also in a constant state of flux. As such, any attempt to outline all of the different platforms would require hundreds, if not thousands, of pages, with many of the details quickly becoming redundant due to the transient nature of the interfaces. Instead, outlined below are a number of different social media platforms that are, at time of writing, amongst the most useful for developing an effective digital footprint as a scientist. An in-depth analysis of the technical details of these platforms has been purposefully avoided, as this is something that can easily change, and which is best found out via experimentation. Instead, a brief overview of each platform is given, with advice on how to best utilise that platform to maximise its potential.

When considering which of these social media platforms to use, select those that are the most suitable for what you want to achieve, and which align most closely with your own preferences in terms of interface, accessibility, and ease of use. It is very easy to become distracted by social media platforms, so make sure that you manage your time accordingly.

7.4.1 Twitter

Twitter [21] is a social media platform that enables you to connect with other users by sharing your thoughts in 280 characters or less, and when used properly it can be an extremely useful tool for effective science communication. One of these 280-character messages is called a tweet, and as well as tweeting text you can also include hyperlinks, images, and video.

The social aspect of Twitter involves 'followers'. These are the people who have decided to follow you, either because they know you or because they find what you have to say interesting or entertaining. Your tweets will appear on their Twitter timeline, just as tweets from the people who you follow will appear on yours.

If you want to tweet a specific user then you should address them using their unique Twitter handle, which is indicated by the '@' symbol. For example, if you wanted to tweet the Institute of Physics Publishing team to tell them how much you are enjoying this book, then you would write something like this:

@IOPPublishing I am really enjoying learning how to be an effective science communicator; thanks for publishing this helpful book. ☺

If you start a tweet with a Twitter handle, then the only people who can see it are those people that are following both you *and* the person that you are addressing. In the previous example, only people who were following both you *and* @IOPPublishing would be able to see your tweet. You can also use Twitter to send a direct message (or DM) to one of your followers, which will only be seen by the two of you, and is a convenient way to communicate discreetly. We advise new (and experienced) users to always check that it is a DM, and not a public tweet, that is being sent.

Here are ten tips for effective Twitter usage:

1. **Pick a good handle.** Make sure that your Twitter handle is not only unique, but that it is easy to remember; @samillingworth is a lot easier for people to recall than @poems_science_games_sam. Make sure that you also include a good profile picture and banner image, and that your Twitter bio (160 characters or less) accurately describes what you do and/or what you tweet about.
2. **Tweet regularly.** In order to gather and retain followers, you should aim to send a minimum of between three and five tweets a day. Think carefully about the messages that you want to send, and aim to send them out during the morning and evening commutes and lunch breaks, when people (in your country at least) will be most likely to be checking Twitter.
3. **Follow interesting people.** As well as following some of the most prominent names in your respective research field(s), you should consider following Tweepers who have something interesting to say about science in general.
4. **Advertise your research.** Make sure that you always tweet a link to your latest publication or talk. It will ensure that it reaches an even larger audience than it would do normally; you can find out exactly how many with the inbuilt Twitter analytics toolkit. Be sure to use Twitter to advertise all of your other digital activity as well; for example, new blog posts and podcast episodes.
5. **Use hashtags.** Using a hashtag (#) enables you to categorise a series of ideas. They also make it easier for people to find and access your tweets, as Twitter enables users to search according to hashtags (topics with the most popular hashtags are said to be 'trending'). For example, if you are tweeting about something related to science communication, try and leave room in your tweet for #scicomm, as it will help to make your tweet more visible.

6. **Be concise.** You only have 280 characters to make use of, so every letter counts. Rather than seeing this as an obstacle, you should treat it as an opportunity to hone your messages so that they are more succinct.
7. **Introduce some personality.** Your followers need to see that you are a real person, with real interests, likes, and dislikes; if there is a cause that you are passionate about then use Twitter to help promote this. Alternatively, if you do not feel comfortable combining your personal opinions and scientific research (or if your institute actively discourages such behaviour), then consider setting up both a personal and a professional account.
8. **Be polite.** Don't say anything on Twitter that you wouldn't say in a room full of crowded people, or to the face of the person you are tweeting about. This is good protocol for all social media platforms, but is especially true for Twitter, where it can be quite easy to send a tweet that you later regret.
9. **Use Tweetchats.** These involve the use of a dedicated hashtag over a set time period to discuss a particular topic. A useful Tweetchat to introduce you to the concept is #ECRchat [22], a global fortnightly discussion for the early career researcher community. It is good practice to forewarn your followers before you participate in such an event, so that they are prepared for a potential deluge of tweets.
10. **Tweet at conferences.** Use the official hashtag of the conference to increase visibility and help others to categorise your tweets. If you are unable to attend a specific conference then following the official hashtag is a useful way of finding out what is being discussed, and also gives you the opportunity to join in with any online discussions.

Exercise: compose a tweet

Think of the next presentation that you are going to give. Try and condense all of the key points into a 280-character tweet. What is at the absolute core of what you want to say, and how can you communicate this in a concise and informative manner? For bonus points, try and include some relevant hashtags.

7.4.2 Facebook

Facebook [23] is an online social networking service in which you can share information, photographs, and videos with your friends and also the wider community. By creating a profile, you are able to present your likes and dislikes, as well as aspects of your personality to everybody that you wish to share that information with. The use of security settings means that when you post certain items to your Facebook 'wall' you can decide who can and cannot see them, and posts from people that you are friends with and groups that you like will appear on your 'news feed'.

The social aspect from Facebook comes from your ability to react to and comment on other user's posts, thereby initiating a conversation that either a very small or a very large number of people can become involved with. There is also the opportunity to send personal messages, and to set up group chats, where you can also share files, much like can be done via regular email.

As well as setting up a personal profile, Facebook also presents you with the opportunity to create a page for your business or other interests, which you can then invite people to follow, and which can ultimately serve as a hub for your enterprise. Here you can share your photos and videos, create events, and invite your friends and followers to attend. There is also the opportunity for people to rate and review your page, and to share it with their friends and colleagues.

Examples of science-based Facebook Pages that have developed strong communities through a reputation for excellent content are: News from Science [24], NASA [25], Physics Girl [26], and Physics World [27]. All of these pages engage with their communities in a meaningful way, posting content that encourages interaction; for example, by posing questions, initiating dialogues, and conducting surveys. While the scope of these examples might be beyond what is achievable for an individual scientist, they serve as inspiration for how Facebook Pages can provide meaningful content to a large and varied audience.

Another way in which to utilise Facebook to engage a large audience with a particular scientific topic is through the use of Facebook Groups. While Facebook Pages are usually designed to act as the official profiles for people, brands, or businesses, Facebook Groups provide a (normally) non-affiliated platform for group communication, enabling people to share their common interests and express their opinions. There are a large number of science groups, dedicated to topics ranging from Basic Physics [28] to Quantum Mechanics [29]. Some of these groups are open (anyone can post and look at what other people have posted), whereas others require users to request access to join.

While Facebook Groups are, in theory, a space for open and constructive discussion, this is not always the case. For divisive scientific topics such as climate change, vaccinations, and evolution, discussions have the potential to veer into ugly, narrow-minded shouting matches. In an attempt to halt such intolerance, most Facebook Groups have a set of rules that must be adhered to, while others require users to answer a series of questions prior to joining, in order to try dissuade any potential troublemakers. However, for those Facebook Groups with many thousands of members, policing them is not always possible, and users might sometimes find themselves being the victims of personal abuse. In such instances, follow the same advice that was provided for dealing with Internet trolls: do not engage with the abuser(s) and report them to the Facebook Group's administrator or moderator, and also to Facebook themselves. This advice also holds true for abuse received on any other social media platform.

The responsibility that Facebook and other social media companies must take when dealing with such abuse is a topic of much debate, and is likely to be unresolved anytime soon. However, that such abuse exists at all is reflective of the society we now live in, i.e. one in which certain people believe that it is ok to abuse

people because of their beliefs. As ethical scientists, we have a responsibility to callout such abuse (on all social media platforms); we also have a duty to respectfully listen to the opinions and needs of others, even if they are not necessarily the same as our own. Furthermore, we have a responsibility to actively seek out and listen to those opinions that are different from our own, as otherwise we run the risk of simply shouting our messages into a digital echo chamber (see chapter 5).



7.4.3 LinkedIn

LinkedIn [30] is a business-oriented social networking service that is mostly used for professional networking. It differs from Facebook in that it is strongly focussed on making and maintaining links with people in a mainly professional capacity. After creating a profile, which effectively acts as a digital CV, there is the opportunity to join different groups, and to connect with people that you know on either a personal or professional basis. In terms of effective science communication, LinkedIn is most effectively used as an interactive discussion board and as a job market.

If you want to use LinkedIn as an effective discussion board, then begin by selecting a number of groups that are related to your field of research and other scientific interests. Many of these groups have moderated membership, and so you will need to provide evidence about your suitability for membership, either through allegiance (e.g. university alumni groups) or through merit and/or your relevant expertise. Once you have gained membership to these groups, the discussion boards are a good way of keeping up to date with any debates that are currently happening in your field of research. Joining these discussion groups is also an effective way to connect and collaborate with other colleagues from across the world. The same advice for Facebook Groups applies here: be respectful, actively seek out other opinions, and don't just treat these groups as an advertising space for your own research and other personal projects. Try to make sure that each of your posts

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Figure 7.2. Example of a CV header, showing LinkedIn and ORCID information.

includes new material that initiates conversation, and that they add something of merit to the ongoing discussions.

In addition to being a useful resource when you are actively looking for a new job, LinkedIn also provides a shop window for future opportunities, some of which you might not even have been aware existed. By maintaining a current profile, and taking an active role in a number of groups and online discussions, you can proficiently market yourself to a wide range of future employers. In order to enhance your visibility, make sure that you keep your profile up to date with regards to your employment history, qualifications, and any awards or accolades. Creating a unique LinkedIn URL (which is free to do) is also recommended, as this can then be placed at the top of a more traditional CV, providing any potential employers with the opportunity to easily find out more about your achievements. Figure 7.2 gives an example of what the header of a typical CV might look like, complete with LinkedIn and ORCID (see section 7.5) identifications. Uploading publications to LinkedIn can be quite time-consuming, so it is advisable to upload three to five key publications that best represent your current research portfolio, alongside a link to other databases (e.g. ORCID) where interested readers can easily find all of your publications.

LinkedIn also presents you with the opportunity to list your skills, which can then be endorsed by your connections, providing evidence to future employers and collaborators that you are a recognised expert in the field. Furthermore, LinkedIn offers the opportunity for longer endorsements, in the form of 'Recommendations' from previous employers and colleagues, all of which can serve to further demonstrate your skills and expertise.

Exercise: update your LinkedIn profile

Many of you might have a LinkedIn profile, but when was the last time that you updated your information? Begin by updating your biography, choosing a profile picture that is professional in appearance, and which ideally comes from the current decade. Make sure that you provide up to date, succinct, and considered content with regards to your education, skills, and experience, then ask some current or previous collaborators to write you an endorsement in the form of a Recommendation. Finally, make sure that you have included any recent accomplishments, and apply to join some groups that are relevant to your scientific areas of interest.

7.4.4 YouTube

YouTube [31] is a video-sharing website, where users can post videos, create playlists and interact with other users by reacting to and commenting on their posts. The central hub of these activities is a user's YouTube channel, and it is where all of the videos from a certain person or organisation are grouped together. These channels can then be subscribed to, ensuring that as a viewer you are kept up to date with the most regular releases from your favourite YouTubers.

In addition to being a useful resource for cute cat videos and DIY instructions, YouTube also hosts a number of innovative science channels, which explore different facets of science and which serve as excellent examples of effective science communication in action. Two of the most widely celebrated are minutephysics [32] and SciShow [33], both of which have several million subscribers, and which provide engaging content covering a range of scientific topics, from exploring dark matter to analysing the discoveries of well-known scientists.

If you are thinking of creating your own YouTube channel, then consider all of the advice that has previously been discussed in this chapter in relation to blogs and podcasts. In addition to this, it is highly recommended that you collaborate with colleagues who have filming and visual editing experience, as there are many examples of potentially engaging YouTube videos that are let down by the amateur nature of their filming. In building your list of subscribers, engage with other YouTube communities and consider doing some guest videos with other successful YouTube vloggers (video bloggers), in order to share your work with a wider audience.

Exercise: get inspired by video

Go on to YouTube and watch a couple of videos from either the MinutePhysics or SciShow channels (or another of your choice). Then scroll down and read a selection of the comments for the most popular videos, and see if you can determine what the audience connected with. If you have something to add to the discussion then feel free to do so.

7.4.5 ResearchGate

ResearchGate [34] is a social networking site that, unlike the other examples mentioned so far, has been designed primarily for use by researchers. ResearchGate is used by researchers to share their publications, engage their peers in discussions, and search for future collaborators and job opportunities.

After building a profile that outlines your areas of research and expertise (in a similar fashion to that of LinkedIn), you are also able to upload all of your publications, either manually or by using Digital Object Identifiers (DOIs). As with LinkedIn, colleagues can endorse you for specific skills and expertise; there is also a

jobs board, which recommends jobs based on your expertise and publications portfolio.

One of the most useful features of ResearchGate is that other researchers can ask you questions about your work directly. ResearchGate also presents you with the opportunity to track your publications' citation rates and to monitor the number of people who have viewed and downloaded your publications from the site. Similarly, you can follow other researchers, to ensure that you are kept up to date with their recent activities.

7.4.6 Others

The social media sites that are discussed above are by no means an exhaustive list, and as discussed in section 7.4 it is a constantly evolving landscape. The sites that have been discussed in this chapter have been chosen because of their relevance, at the time of writing, to establishing a meaningful digital footprint as a scientist. Other platforms that are worth a quick mention include Instagram [35] and Flickr [36], which in essence act as community photo depositories. Mendeley [37] and Academia.edu [38] are alternatives to ResearchGate in the researcher-only social networking category. Reddit [39] is often referred to as the 'front page of the Internet', and is effectively a group of hundreds of thousands of message boards, in which any topic you care to think of is discussed and deliberated. Finally, Periscope [40] is a social media tool that allows you to livestream (i.e. broadcast live), giving observers the opportunity to ask live questions and to interact with you in the process. As Periscope is owned by Twitter, it also allows you to connect easily with your Twitter followers and to notify them of your Periscope broadcasts.

Another useful digital utensil is IFTTT [41], a web-based service that stands for 'If This Then That', and which allows you to create your own unique automated combinations or 'recipes'; for example, tweeting a link to your blog as soon as a new article is posted. This helps to ensure that all of your outputs are linked up into a coherent stream, turning your digital footprints into an elegant waltz. Social bookmarking sites such as Diigo [42] and Mix [43] also allow you to follow other people's digital footprints, helping you to track resources, opinions, and comments, and to generally keep in touch with a number of varied and appealing communities.

7.5 Digital collaborations

As well as being a vital resource for advertising your skillset, finding information, and managing your research portfolio, the Internet provides the perfect means for truly international collaboration, via nothing more than a couple of mouse clicks or the touch of a screen. Emails have long since replaced the traditional letter or fax as our communication tool of choice, but there are many other innovative and effective ways with which we can collaborate with other scientists from across the globe.

Video conferencing represents an effective way of having group meetings, with the elimination of unnecessary travel, saving time and money while also having a positive impact on the environment. There are a number of video conferencing facilities available, both free and paid for, and as with the different social media platforms it is

recommended that you experiment with several to determine which of them are the most suitable for your needs. Perhaps the most well-known examples are Skype [44] and Zoom [45], both of which offer free and paid-for versions of video conferencing facilities, with screen sharing, recording, and other tools also available.

When hosting or participating in a videoconference, always test the connections beforehand, and make sure that your colleagues have both the relevant accounts and software that are necessary for them to participate. If there are a large group of active participants, then it might be an idea to communicate via the instant messaging facilities of these conferencing suites instead, as it can be difficult if 15 or 20 people want to talk at once. As with all meetings make sure that the chair enables all voices to be heard, and stick to a pre-circulated agenda.

Document sharing facilities, such as Google Docs [46] or Dropbox [47], provide a platform for collaborating on a document or presentation, allowing you to share and co-edit documents in real time. This means that you can handily create folders for different research projects, and easily share them with other collaborators, enabling them to work on them wherever access to the Internet is available. Similarly, Slack [48] is a cloud-based piece of collaboration software that includes direct-messaging capabilities, notifications and alerts, document sharing, and group chat. As Slack also offers integration with many other services, such as Google Docs and Dropbox, it is an effective way to organise research projects. Many users prefer using Slack to email, as it is much easier to navigate and keep track of conversations than it is when attempting to navigate long email threads.

Finally, one of the most important tools to have in your digital arsenal is ORCID [49], a persistent and unique digital identifier that distinguishes you from other researchers, and which can be assigned to your publications. This is extremely useful if you have used multiple combinations of your name across your publications. This personal identification number can also be applied to research grants, helping to ensure that you always receive credit for your work. Including a link to your ORCID profile is also a means by which to reference your publications in a traditional CV, where space may otherwise be limited (see figure 7.2).

7.6 Summary

This chapter has discussed the importance of creating a manageable, informative, and attractive digital footprint, offering practical advice and guidelines on how to set up and manage successful blogs, podcasts, and social media profiles.

With so much choice it is very easy to get overwhelmed; it is simply not possible to write a number of successful blogs, run a podcast, have an active presence on every social media site, and also carry out scientific research. The most effective way of building a useful and enjoyable portfolio is to dip your digital footprint into a few of the different media, determine which of them are most suitable to your own skills and needs, and then focus on creating innovative content and meaningful communities in those that you select.

One final comment relates to the issue of personal vs. professional posts. Some employees have very strict rules with regards to what you can and cannot publish on

certain social media sites, and what disclaimers you must use if you do. Read these carefully, and before you post anything to any platform ask yourself this question: 'am I both willing and able to defend these statements?' Never say anything that you would not be willing to say in person at a scientific conference, and if you are discussing preliminary results then make sure that doing so will not jeopardise any future publications for you or your colleagues.

7.7 Further study

The further study in this chapter is designed to help you think about developing your online presence and digital footprint:

1. **Record a podcast.** If you think that audio is the media for you, then follow the advice given in section 7.3 and set up your own podcast. Take the time to plan out in advance roughly what you will be talking about (be warned though, as fully scripted podcasts can sound a little unnatural), how you will market the podcast, and how you intend to develop a community around it.
2. **Join a Tweetchat.** Find a Tweetchat that you think will be interesting and relevant to you, and to which you have something to contribute. After joining in with a couple of sessions, enquire about hosting one, as normally the role of facilitator is rotated around the more active participants of the Tweetchat.
3. **Create/update your ResearchGate profile.** Fill in all of your details and upload your publications. Then, take the time to connect with some colleagues and co-authors, and endorse them for any skills that you think they possess. Read some of the general questions that have been posted about topics in your field of expertise, and see if you can provide any answers or contribute to any ongoing debates. Finally, update your ORCID profile, enabling all current and future publications to be easily traceable back to you.
4. **Build a website.** If your digital footprint is starting to feel stretched, then it might be an idea to start thinking about building a personal website. Doing so will enable you to either host or advertise all of your digital output from one easily manageable location. There are many examples of free and paid-for website builders; make use of the free-trial periods that most of these builders offer to find the one that works best for you and your audience.

7.8 Suggested reading

There are several books and other resources that aim to teach you how to build a following across all possible social media platforms and beyond. 'An Introduction to Social Media for Scientists' [50] is a helpful journal article which caters for scientists specifically, while *53 Interesting Ways to Communicate Your Research* [51] provides a number of tips for communicating your research digitally. For those of you who are interested in setting up a blog, then *Science Blogging: The Essential Guide* [52] provides a useful how-to guide for communicating scientific research and discoveries

online. Finally, ‘Podologues: conversations created by science podcasts’ [53] is an eye-opening study into how podcasting can be used as a tool for science engagement.

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