

Science Journalism Handbook



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Foreword

The coronavirus epidemic has been a shock not only for politicians and decision-makers but for professional journalists, too: our ability to adapt to a new situation requiring many new skills has faced a difficult test. When the virus first began spreading, news coverage fell well short of scientific rigor, sometimes relying on imprecise data, opinion-driven reporting, and speculation. Fake news – preying on people’s fears and anxieties regarding an issue of such mortal significance – became common.

Amidst these challenges, the Al Jazeera Media Institute (AJMI) concluded that the formerly modest debate surrounding science journalism, along with its vital role in society and in preserving human life, should be placed at the center of the discussion on the future and development of journalism. In order to turn this conclusion into something more practical, we set about compiling a series of articles and reports of theoretical and practical interest, as well as interviewing expert Arab science journalists about the state of the field and how it might be developed.

Nothing happens in a vacuum. The inspiration for all this was the COVID-19 pandemic. But the pandemic was not central to the discussion. Instead, we tried to explore the foundations of science journalism as a whole. The eighteenth issue of AJMI’s Al Jazeera Journalism Review (Majallat Al Sahafa) was thus dedicated to this specific genre of journalism, approaching the issue from various angles (mediating science for the public, scientific rigor, sources, science writing, investigation in science journalism).

This handbook is the product of all the information accumulated throughout this process. It equips journalists with the tools and strategies they need to write professional and conscientious science pieces, beginning with ideas and sources and continuing through to writing and engaging with the public. It also aims to make a record of prior experience and to advance our knowledge of the topic – especially within the Arab World, where science journalism is, after all, still a very new field.

Al Jazeera Media Institute



Introduction

Is there a cure for the coronavirus? Is investing in cryptocurrency safe? How polluted is the air in Beirut after the ammonium nitrate explosion that levelled its port? Have 5G networks been causing cancer?

Since the beginning of the pandemic, coronavirus coverage has dominated our headlines, our screens, and our airwaves, racing ahead of the economic and political stories that normally lead the news. This transformation has shown just how poorly equipped journalists are to deal with scientific sources and to transmit science news to the general public.

Of course, science news cannot simply be limited to pandemics or health. This is a time of fierce international competition to innovate technologically, in sectors as vital to our daily existence as medicine, the environment, leisure, business, security, and defense. With science occupying an unprecedented position in our lives, every new idea is liable to become a research project requiring investigation, answers, and logical explanation.

A psychology paper published by Queen's University in Canada estimates that under normal circumstances, a human being has an average of 6200 ideas a day ¹. A Google search along the same lines will give you answers ranging from 50,000 to 70,000! And if this is true of people in general, what about the questions asked by specialists around the world every day?

Reliable studies suggest that there are as many as 8 million researchers working in various scientific fields worldwide ². This may not seem like very many compared to the total global population, but the amount and the importance of the work that these researchers produce is wildly disproportionate to their number. Their studies touch on every detail of our daily lives: our behavior and way of thinking, our health and leisure, our food and drink. This raises a number of questions:

- How do we cover the greatest possible quantity of relevant scientific studies?
- How can we know that they are credible or objective, given that scientists are, like us, human beings with their own biases and interests?
- What are the factors and criteria that determine which studies we find out about from the press? How are these studies selected?

Answering these questions requires serious thought and familiarity with monitoring, research, examination, and selection tools. You will then need to understand, investigate, write, explain, and narrate. All this, taken together, forms the essence of science journalism – which this handbook explores in depth. This type of journalism cannot be ignored. Done correctly, it might well offer a new ray of hope for a traditional journalism in crisis.

¹ Lu, Yun. "Neural Transition Metric in fMRI: Categorization and Application." PhD diss. <https://bit.ly/2ZuE2L1>

² BAUMBERG, J. (2018). *The Secret Life of Science: How It Really Works and Why It Matters*. Princeton

Introducing Science Journalism

A working definition of science journalism is that it is any attempt to obtain scientific knowledge and publish it in a way that is comprehensible to a lay public. Any story that seeks to present a scientific explanation constitutes science journalism. While a piece on the damage caused by an earthquake, for example, would not be science journalism, one on the timing of this particular earthquake and its implications for future seismic activity certainly would be.

The centrality of science to this kind of journalism does not mean that we can forget the basic rules of writing. In traditional journalism, we learn that a good story should contain characters, a story, and a solution or result. A good science story uses the same narrative style to inform the public about science. Instead of the president of one or another country, the protagonist of a science story might be a virus, a light particle, a black hole, or a computer.

These key story elements are the basic measure of a science piece's professionalism. There are many newspapers, websites, and publications that cover scientific issues in a traditional style that is totally at odds with the nature of the content. People have learned to judge these publications.

Issues that generally fall within science journalism's purview include:

- Results of scientific studies
- Summarizing scientific papers and articles
- Points of intersection between science and other issues (education, work, retirement, society, security, etc.)
- Debates within the scientific community on key issues
- The history and development of science itself

Science Journalism: Who Is the Audience?

As technology has become ever more central to our daily lives over the last few decades, the audience for science journalism has grown ever larger, and today, this audience includes almost every reader, viewer, or listener. And like all other media consumers, science journalism's audience is relying less and less on newspapers, TV screens, and radio sets, preferring to get their information from smartphones. In fact, scientists' increased visibility on social media has whetted the public's appetite for science news.

Science journalism's ideal audience, then, is the same as that of traditional journalism – with the essential caveat that the individual's general knowledge on the subject is more important in science journalism. Science journalists have to be more sensitive to the fact that their audience will have a variety of scientific backgrounds, with some lacking any knowledge of the topic at all.

As in traditional journalism, the medium will be crucial in deciding the target demographic. Is the piece aimed at a particular group in a particular area, or does it have a broader scope? Are we speaking to an elite audience looking for more depth, or to the general public? Knowing your audience is central to deciding what the story will be and how it will be presented – as well as how widely it will be circulated. A professional science journalist has to be able to bridge the eternal gap between scientists, science, and the public, communicating ideas as smoothly and clearly as possible.





Science Journalism and Science Journalists

To read a foreign language, you consult a translator. Science journalists are, in a way, translators. They explain science (methods, systems, results, importance) to the general public. To be successful, a science journalist needs to be able to do two things:

- Tell exciting stories well (as a journalist).
- Take the time to understand scientific issues outside their own area of expertise (as a scientist).

In recent years, science journalism has become its own field, even in developing countries. Despite the rigor that it demands, specialist knowledge of the subject that you are writing about is not a precondition of being a science journalist. What is a precondition, however, is an ability to research and understand scientific data.

It has sometimes been argued that scientists working in highly technical fields (neurology or psychology, for example) should learn to write in a journalistic style in order to communicate their knowledge to the public. This is particularly important, because the key to understanding the relevance of new discoveries is their context within the field. With ready access to information, however, journalists themselves can easily learn about the scientific background before publishing a story.

The basic skill set of a science journalist is identical to that of the traditional journalist but often requires greater effort. A science journalist's sources are specialists and re-

searchers, and communicating with them requires greater rigor and awareness than political or media sources. Moreover, they have to work more closely with designers and photographers to guarantee clarity. Many studies show that the public generally prefers pictures and diagrams when dealing with complex issues.

The main challenge in science journalism is maintaining the highest possible level of objectivity, particularly on ultra-polarized issues. Take, for example, the international race to develop a coronavirus vaccine. Coverage of vaccine-related stories requires caution and self-control in order to separate political bias from professional duty. As Mark Twain put it, "Be careful about reading health books. You may die of a misprint."

In summary, a science journalist needs the following skills:

- The ability to research and investigate
- The capacity to communicate simultaneously with both the general public and the scientific community
- Analytical skills
- An interest in science
- Rigor and precision
- Neutrality and objectivity
- An understanding of scientific writing





The most important differences between science journalism and its traditional counterpart are specialization and depth.

While a traditional journalist looks at a news item itself, science journalists look behind it, searching for reasons and background.

During the coronavirus pandemic, for example, traditional journalism has kept us up to date on the number of cases and deaths and the measures taken by governments to fight the virus. Science journalism, on the other hand, has presented the details: What is the coronavirus? Why is it dangerous? What do animals have to do with it? Is it a conspiracy, as some have claimed?

Science journalism scrutinizes the information available, distinguishes the factual from the misleading, and corrects misconceptions – the idea that hot weather or smoking protects you from the coronavirus, for example. It also has to simplify concepts for a lay audience without distorting them, which requires a solid understanding of the subject: not every journalist can produce a medical piece on cancer, for example.

Arab science journalism – much like traditional journalism – is affected by the broader climate in the Arab World. Although journalism as a whole has made significant headway in many parts of the Arab World, there are still restrictions: journalists are targeted and attempts made to sway them, media outlets can be closed down, and funding is generally limited.

Science journalism suffers from these restrictions just as much as traditional journalism. But it also faces unique challenges: Arab outlets are often uninterested in appointing science journalists or in providing budgets for their work, since they are often seen as an unnecessary luxury. This is clearly incorrect, especially given the Arab public's great interest in recent years in non-political subjects – particularly medicine, technology, and science.

Nonetheless, the future looks promising for Arab science journalism. There are more and more Arab media outlets eager to appoint science journalists and invest in producing specialist and professional science journalism.

Osama Abu El Rub

Medical Affairs Editor, Al Jazeera.Net

I Case Study: Coronavirus

There has been a huge amount of coverage on COVID-19 in both the Arab World and elsewhere, with a concurrent marked spike in fake and misleading news. A study published on March 19, 2020, by the Center for Informed Democracy and Social-cybersecurity (IDeaS) at Carnegie Mellon University estimates that some 60% of U.S. Twitter accounts discussing the coronavirus were, in fact, bots set up the previous February in order to disseminate fake content promoting conspiracy theories and the reopening of U.S. society.³

These accounts targeted groups influential in public opinion formation – activists, minorities, and immigrants – by boosting dozens of misleading stories spread by 82% of real accounts. One of the main stories in this disinformation campaign focused on a theory that the virus was a biological weapon developed by hostile countries.

The problem is not limited to the public, however. Government institutions are also important media sources. One of these institutions is the National Center for Medical Intelligence, which is responsible for the health of U.S. military forces at home and abroad⁴. Since the first weeks of the pandemic, U.S. newspapers and news agencies have relied on this organization as a trusted source, alongside the Centers

for Disease Control and Prevention (CDC). The remarkable influence of U.S. policy and national interests on what is published by these agencies is obvious⁵, particularly given that most local media rely on U.S. media to one extent or another in their coverage of international affairs.

If this is what is happening in the most powerful country in the world, what sort of chance do the rest of us have?

The coronavirus pandemic is a scientific issue with great political, security, and economic ramifications, an issue in which fake news is a natural, predictable, even dominant phenomenon. The only way to address this phenomenon is to make sure the public is better informed. And the way to do this is through good science journalism.

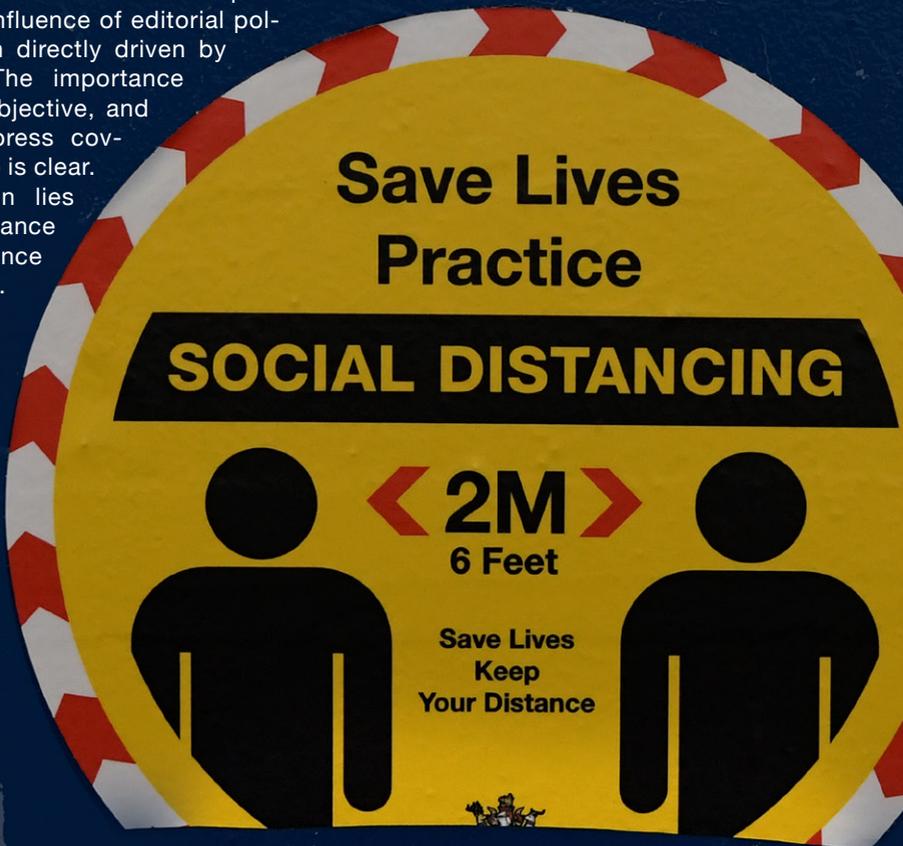
3 - <https://www.cs.cmu.edu/news/online-misinformation-about-covid-19-can-take-many-forms>

4 - <https://www.nbcnews.com/health/health-news/spying-coronavirus-little-known-u-s-intel-outfit-has-its-n1157296>

5 - <https://theintercept.com/2016/08/10/how-the-u-s-spies-on-medical-nonprofits-and-health-defenses-worldwide/>

There is another factor of great importance to coronavirus news-making. Traditional journalists are exposed on a daily basis to vast quantities of often negative news, but do not notice how this affects their own behavior and mindset. This psychological effect naturally has implications for their work, for their choice of topics, and for the way they approach these topics. Emotional responses produce hasty or incomplete judgements or emotive language that says more about the writer's state of mind than about reality. There has been a distinct uptick in intemperate headlines since the pandemic began.

This problem can be solved, once again, by clearheaded journalists not obsessed with scoops and free from the influence of editorial policies often directly driven by politics. The importance of bold, objective, and rigorous press coverage here is clear. And herein lies the importance of science journalism.





On the very first day that a state of emergency was announced in Milan, I decided that I would record my day-to-day life in pictures – as a way of letting off steam and depressurising. The rising death rate and the dead bodies I saw every day at the hospital where I work were difficult to deal with. As doctors, we're always dealing with death and sickness, but this pandemic was something completely out of the ordinary. I quickly decided that I would share what I witnessed on a day-to-day basis as a sort of warning to others about this new and unfamiliar enemy.

I started to take pictures and film video clips using my phone, making sure to always respect the dignity of victims. I also photographed the empty streets and other signs of the new normal in northern Italy.

After recording my first video and sending it to family in Lebanon to warn them about the virus, I was surprised by how quickly the clip was shared. It had really spoken to people's need for expert information on the issue. I started to record video clips almost every day, showing the reality of what was happening at the heart of a global coronavirus hotspot.

Within a week, messages were pouring in from various media outlets asking to interview me for newspapers or on TV. I had never thought of being a journalist: I love being a doctor and teaching medicine at a university. But I felt that it was my duty to show people in the Arab World the reality of what was going on, particularly since the epidemic we were facing was (and is) still shrouded in mystery.

Most interviewers from Arab satellite TV channels kept repeating the same questions – questions that showed limited familiarity with this extremely serious scientific issue. Nonetheless, I carried on answering them: my aim was to inform the public.

Within the last few months, I have conducted hundreds of interviews. I have noticed that few journalists ask scientific questions showing good preparation, and that they rephrase my sentences and my ideas so that the public can understand.

In the beginning, getting information across was difficult, not least because I am so used to using Italian, English, and French terminology. But with time, I've managed to get over this problem by reading more intensely in a range of languages.

Fouad Kanso

**Lebanese-Italian professor
involved in the fight against the coronavirus in northern Italy**

Case Study: 5G Internet

Warnings about the supposed dangers of 5G networks had already spread like wildfire on social media and in traditional media worldwide when the coronavirus pandemic began, and this new development has only fed the theory that these networks are part of a vast conspiracy.

In late 2019, AFP published a report on the health risks associated with the new technology ⁶. You might expect that a piece from one of the oldest news agencies in the world would give you a clear and scientific answer to this sort of question, but this report will disappoint you. Its closing lines tell us that the French Agency for Food, Environmental and Occupational Health & Safety is set to conduct a study on the effects of 5G, which will be completed by the end of 2020. And although this report was published on the section of AFP's website dedicated to fighting fake news and concerns a purely scientific topic, no clear answer is given to the question: How dangerous is 5G internet to human health?

Arab and international news is replete with pieces on 5G internet and the fierce international competition for control of the new network infrastructure. But objective, scientific reporting is very thin on the ground.

A Google search, for example, gives us 3,840,000 results relating to 5G internet and its political impact, but only 436,000 on its health risks – and tens of thousands of the pieces in the latter category cannot be counted as science journalism in any sense.

Activating a 5G network requires transmitters (transmission towers) to be set up nearby in order to broadcast the high-frequency waves that carry the data. In all the countries that choose to adopt the new technology, transmitters will have to be put up in residential areas in order to provide the service. These transmitters are 1.2 meters tall and operate constantly at high frequencies.

In 2017, 171 scientists from 36 different countries signed a petition ⁷ warning of the possible negative effects of 5G on human health. This was based on an earlier petition, submitted to the UN by 220 scientists, which called for a range of measures to be taken to protect humans from the risks of “unsafe electromagnetic fields,” ⁸ by which they meant the 5G frequency.

⁶ <https://factual.afp.com/ar/5%20g%20sante%2010-19>

⁷ <https://www.actu-environnement.com/media/pdf/news-29640-appel-scientifiques-5g.pdf>

⁸ https://emfscientist.org/images/docs/transl/Arabic_EMF_Scientist.Appeal_2017.pdf

This petition stated that:

“Numerous recent scientific publications have shown that EMF affects living organisms at levels well below most international and national guidelines. Effects include increased cancer risk, cellular stress, increase in harmful free radicals, genetic damages, structural and functional changes of the reproductive system, learning and memory deficits, neurological disorders, and negative impacts on general well-being in humans. Damage goes well beyond the human race, as there is growing evidence of harmful effects to both plant and animal life.”

Is this enough to form a solid conclusion

on the health risks of 5G? What has changed since it was first published? How did these scientists reach their conclusions? Who funded the studies that confirm or deny the existence of health risks? Are there measures that can be taken to counteract any possible dangers to human health? These are just some of the many questions someone interested in a scientific issue has to ask – and yet more evidence of the importance of specialized science journalism.





Ten years ago, my editor asked me to write a piece about something called a synchrotron. I remember because it took me a long time to learn how to pronounce its name.

The academic discussion on physics and biology meant that at first I wasn't sure how I was going to present any of this to the public. Then the scientist started explaining to me how the synchrotron had helped haircare companies in France. He told me that it was able to show the amount of fat in an individual hair before and after using a product. And at that moment, a voice in my head said: "that's it!"

When confronted by apparently impenetrable specialist terminology and concepts, it is a science journalist's job to act as the point of contact between researchers and the public. Like a pearl diver, you have to be able to pick out phrases that will resonate with the audience – phrases that contain a lot of scientific detail and meaning, that will have a real effect on the public's awareness and behavior.

For a science journalist to play this role, they need enough specialist knowledge to understand and discuss the research. This is where your angle comes in.

A journalist with no specialist understanding of new desalination technologies may see an exciting story and a magic bullet to solve the Middle East's water supply problems. But science journalists should be able to examine the utility of the project and ask deeper questions. How much does it cost to produce a liter of water using this technology? How are the by-products disposed of? Will consuming seawater affect its salt content, or impact on sea creatures?

Rewriting the same old story is bad for any journalist, but for a science journalist, it is an unforgivable crime. The nature of their field means they have to avoid repetition or overcomplication at all costs so as not to make their audience feel stupid or ignorant. Science journalism that makes the audience feel stupid is just a self-satisfied journalist showing off.

In the Arab World, there is a particular problem with the infrastructure of science media, which requires not only a writer but also specialized editors and sub-editors. The clear limitations of Arab science journalism mean that the best that can generally be hoped for is to employ a single specialist writer as the first step toward a more integrated system.

The shortcomings of this infrastructure, the lack of a system allowing the verification and repeated review of information, the absence in many cases of even a single specialized science journalist, and the habit of entrusting scientific stories to any journalist who will take them – all this means that science reporting in the Arab World is chaotic and undermines its rigor. Indeed, it has meant the media itself contributing to misconceptions about scientific theories. Media outlets have consistently alleged, for example, that Darwin's theories claim that "humans are descended from monkeys." In fact, they say that humans and monkeys share a common origin, which is very different!

The overall weakness of Arab science media has been made clear by coverage of the coronavirus epidemic, which has relied on translations of foreign studies and the advice published by international organizations without making any effort to connect or edit. But the individual weak points require more study to properly diagnose. We need to know where we stand before we can work out where we should be heading.

I would like to note that Arab science media has accumulated quite a lot of experience in covering environmental issues. But when it comes to more specialized scientific questions, such as health, our science media is in much the same state as our scientific research. Both need a lot of support and direction.

Rehab Abdalmohsen
Science Editor

Case Study: Deepfake

In 2019, the website allmetric identified a paper written by four computer scientists as the most-discussed academic work of that year worldwide ⁹. This paper described how deepfake AI had been able to produce a video clip from a single still ¹⁰. The title, “Few-Shot Adversarial Learning of Realistic Neural Talking Head Models,” is practically incomprehensible to the average reader – never mind the content. The authors, writing for an expert audience, use a slew of opaque technical terms.

Nonetheless, this paper, recast into more appropriate language, received widespread newspaper coverage. Audiences were drawn in by eye-catching titles like “The Mona Lisa was brought to life in vivid detail by deepfake AI researchers at Samsung” ¹¹ and “Samsung deepfake AI could fabricate a video of you from a single profile pic.” ¹²

As an audience, we are interested less in the achievements of researchers than we are in how they can be used. Deepfake technology is obviously attractive to security and intelligence agencies, and human beings more broadly tend to be quite willing to break the law when they know they can get away with it. In the age of fake news, it would be no surprise if a widely circulated video of a world figure caught in a compromising position turned out to

be a fabrication. In fact, it has now been proven that technology can produce convincing clips of people saying things that they have never said.

Innovations of this kind are of more than just scientific or ivory-tower relevance. They have direct effects on our daily lives. You have probably seen the fabricated video of Mark Zuckerberg talking candidly about his power and influence as the owner of Facebook. ¹³

⁹ - <https://www.altmetric.com/top100/2019/?details=60733304>

¹⁰ - <https://arxiv.org/pdf/1905.08233v1.pdf>

¹¹ - <https://www.businessinsider.com/mona-lisa-brought-to-life-by-samsung-ai-2019-5>

¹² - <https://www.cnet.com/news/samsung-ai-deepfake-can-fabricate-a-video-of-you-from-a-single-photo-mona-lisa-cheapfake-dumbfake/>

¹³ - https://www.instagram.com/p/C80IEh3lhPr/?utm_source=ig_web_copy_link

The table below shows media circulation of the deepfake paper. It only includes science journalism, not traditional news stories.

Medium discussing the paper	Number
Media outlets	91
Blogs	17
Tweets	55,148
Facebook pages	8
Scientific stories	124

These numbers remain accurate as of the time of writing (end of August 2020).

Models of Science Journalism

A study published by Concordia University in Canada categorizes different kinds of science journalism as follows:¹⁴

1 The Science Literacy Model

This model focuses on increasing scientific awareness among the audience and providing the information they need to make decisions in their daily lives. In this model, scientific data is presented as fixed and verified. Here, a journalist assumes that the audience lacks essential knowledge of the topic, and their job is to transmit the message downward – from the scientists to the public. Having understood the research and the data themselves, the journalist has to “translate” it into an easily digestible news story.

2 The Contextual Model

The Contextual Model, like the Science Literacy Model, focuses on the top-down transition of information. But it presents this information differently, emphasizing a context relevant to the audience. This context may be influenced by the audience’s geographical location or demographic identity. For example, coverage of an earthquake in Japan – where tremors and quakes of various kinds are a weekly phenomenon – will differ from coverage in a country less used to seismic activity. This approach is more closely tailored to the needs and interests of the audience.

3 The Lay Expertise Model

This model is often considered to be an extension of the Contextual Model, but there is an essential difference: the Lay Expertise Model treats scientists and expert individuals as equals. This model is commonly used for issues in fields such as agriculture, where the audience is happy to see an agricultural expert, whether their comments are backed up by the science or not. One criticism of this approach is that it treats scientific theories and research as “limited” or “unverified” and relies on “experts” even if they lack the required specialist knowledge.

The Lay Expertise Model is also common in political journalism, particularly in the Arab World: experts are brought in to talk on a range of different subjects, regardless of their familiarity or experience with the topic.

Despite its problems, this model is often helpful in small societies with a great deal of trust in “experts.”

14 - Secko, David M., Elyse Amend, and Terrine Friday. “Four models of science journalism: A synthesis and practical assessment.” *Journalism Practice* 7, no. 1 (2013): 62-80. <https://bit.ly/32lCsNt>

4 The Public Participation Model

This model encourages science to interact with its environment – that is, it is not interested in educating people or filling the gaps in their knowledge so much as in stimulating debate between pressure groups and those with a stake in the results of scientific research.

An example of this model is the conflicting reports published in media outlets funded by different donors. The point is not that journalists are publishing lies or misleading information, but that particular scientific points are given priority over others.

There are many criticisms of this approach, which is often exploited by politicians and seems more interested in creating controversy than in educating the public.

Differences between Models of Science Journalism

Contextual Model

- Aimed at a particular audience
- Presents information differently depending on location and background
- Transmits information from scientists to the public

Science Literacy Model

- Translates science
- Fills gaps in the audience's knowledge
- Transmits information from scientists to the public

Public Participation Model

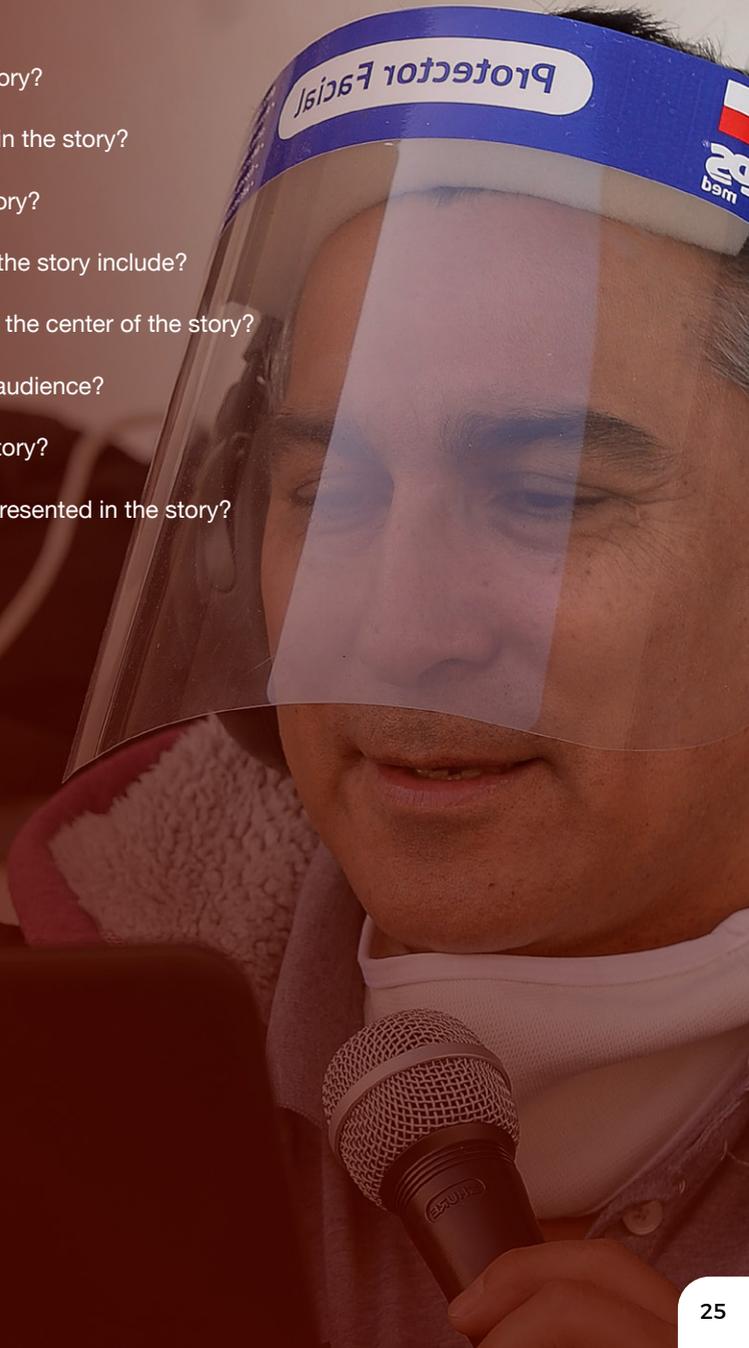
- Presents science as integrated with society
- Calls for “democratization” of science
- Aims to stimulate public opinion

Lay Expertise Model

- Treats science as relatively limited
- Values non-scientific knowledge
- Prioritizes interaction with the target audience

Science Story Question Checklist

- ✓ Why should I write this story?
- ✓ What is the central issue in the story?
- ✓ How should I write the story?
- ✓ What information should the story include?
- ✓ What voices should be at the center of the story?
- ✓ Who is the story's target audience?
- ✓ Is the public part of the story?
- ✓ How should science be presented in the story?



Writing Science Journalism

Could you write a neurology story about a comedy film? Of course – laughter is only the result of neurons firing.

All news stories have a scientific dimension. A professional science journalist can always identify this dimension.

There is no reason that science journalism has to be “dry” or “serious.” You may be surprised when we say that some of the most successful science journalism takes a comedic or human angle. But this journalism is successful because the public is particularly attracted to entertainment. Science has demonstrated that enjoyable learning is successful learning.

Finding a non-traditional scientific angle on a particular issue that will attract public and media attention requires professional skill. Success in planning a science story begins with an interesting question or a person who fills a gap in public knowledge.

In all cases, before starting to write a story, you should always:

- Understand the issue (scientific writing does not mean being an academic expert in the issue but being a researcher).
- Establish the scientific data and distinguish it from fake news.
- Gather trusted information.
- Compare different sources.
- Find appropriate experts.
- Review previous studies.
- Work out who the intended audience is.
- Tell us about the story!

Whether you are writing a news piece, an investigation, or a report, a story is always a story. Whether the topic is nutrition, health, or nuclear energy, the underlying principles do not change. Of course, the layout and structure of the story might change depending on the type of media that is going to publish it. But the process leading up to the final stage of actually writing will always be the same.

A good science story is not simply a list of facts and data. The smooth flow from one idea to another, from one paragraph to another, also plays a role in “simplifying” information. It is a good idea to include personal stories and real-life examples to get the audience interested.

Statistics and figures are a prominent feature of science journalism. This data must be verified as far as is possible. It should not be presented out of context or in partial form, as is common in traditional journalism.

One of the key principles in writing science stories is to draw on numerous sources. Unlike political journalism, for example, a plurality and diversity of sources in science journalism does not usually mean presenting a range of different opinions. Instead, it involves linking together the opinions of experts from different disciplines. Differences of opinion should be emphasized in a few cases only:

- Where the bodies sponsoring the studies have conflicting political or financial interests linked to the results of the research. Here you should expose these interests in order to identify the scientific data that is most precise and objective.
- Where there are theoretical disputes between scientists from the same field because there is no consensus as yet on how a particular issue should be explained. In this case, you should present the disagreement within its scientific and historical context without favoring one side or the other.

Generally speaking, a good journalist is able to put across their excitement, their feelings, and their ideas to others. The extent to which they can do this determines how successfully they can influence popular consciousness.

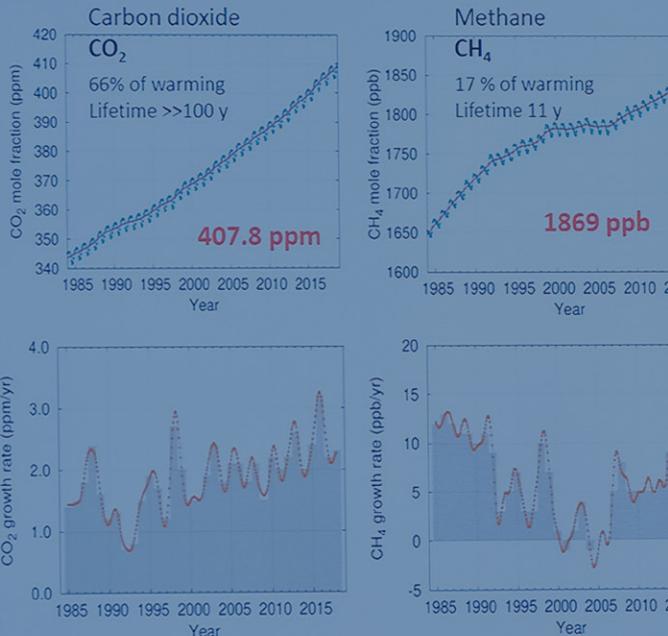
Simplifying and Mediating Science for the Public

Making science easily digestible for the public is one of the biggest challenges for science journalists.

Consider the following example. You are a science journalist covering a new discovery in genetic engineering. Do you launch immediately into “clustered regularly interspaced short palindromic repeats” (CRISPR for short), or do you present the audience with a brief and clear explanation of the makeup of human cells and then move gradually toward more difficult concepts? You should never forget that you are dealing with a non-specialist audience. Knowing where to begin your story is the key to success.

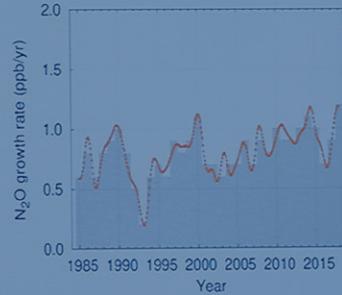
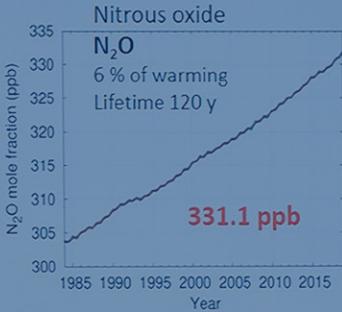
Another key skill is connecting ideas together over a series of tightly written paragraphs or sections. Jumping from one idea to another will cause the audience to lose concentration. People with busy lives do not like having to make a lot of effort to understand an article or a news item. A journalist who loses their audience’s concentration has failed. The same applies to graphs, charts, images, and other ways of presenting a science piece. Any picture, video clip, or infographic can very easily confuse the audience if it is unclear or overcrowded.

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WMO OMM

New records

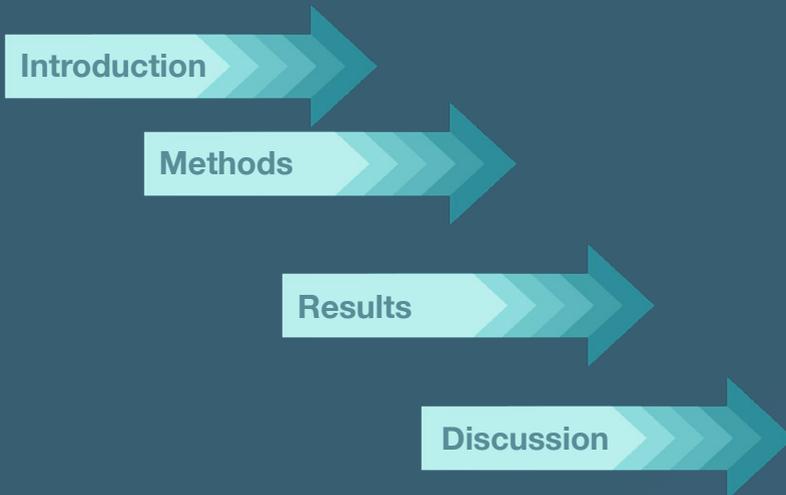


A good explanation is one that someone distracted by their phone can follow: uncomplicated, straightforward, and comprehensible, even to someone busy doing something else. Think of it like Microsoft Paint. We are all aware of the variety of cutting-edge image modification software available to those who need it – but thanks to Microsoft Paint, only a few of us ever have to use it. Why complicate things?

A science piece should not be a test of the audience's intelligence. It should be an opportunity for them to learn something new.

General Advice on Writing Science Pieces

- Organize your thoughts. If necessary, begin by supplying the reader with the necessary background.
- Put connected thoughts together in independent paragraphs.
- It may help to use the following scheme (known as IMRAD):¹⁵



- Use short sentences when possible, avoid complex terminology, and explain unfamiliar words.
- Do not use ambiguous words or filler.
- Provide the audience with clear descriptions. Tell them a story.
- Avoid lengthy or complicated presentations of information. Your main goal is to inform the public.
- Do not present the same ideas in a different style. The audience isn't stupid!
- Only use the passive voice in exceptional and rare cases. Science journalism depends on clearly stated sources.
- Re-read your work to ensure it is clear and accurate.

¹⁵ - <https://lijunsun.github.io/files/ScientificWritingV39.pdf>

Finding an Idea

- 1 Subscribe to science journals and websites.
- 2 Question everything.
- 3 Look for scientific explanations for everything.
- 4 Ask yourself about the scientific dimensions of public policy.
- 5 Follow developments in the scientific community.
- 6 Join scientific societies and organizations.
- 7 Develop a network of expert contacts from different fields.
- 8 Participate in conferences, seminars, and other scientific activities.

خاص الجزيرة

عائلات أردنية بأكملها مصابة بكورونا وتعالج
في مستشفى الملك المؤسس بمدينة الرمثا

الإصابات 4.667 الوفيات 94 حالات الشفاء 632

اليابان



Where to Begin

Most science journalists worldwide work as freelancers. There are various reasons for this, the most important of which is the limited number of specialized media outlets compared to those involved in more traditional journalism. There is nothing wrong with being a freelancer, especially given the increasing demand for science journalism. In fact, working outside the framework of an organization allows you to be more independent and objective. And with changes to the way we work and the structure of economies worldwide, it is not just science journalists who are turning to freelance work.

Given the lack of specialized science journalism, you might find the following websites and remote learning programs useful:

- 1 **Science Journalism at the Columbia Journalism School**
- 2 **MA in Science Writing at Johns Hopkins University**
- 3 **MA Graduate Program in Science Writing at MIT**
- 4 **Science, Health and Environmental Reporting at NYU**
- 5 **MA in Science Communication at UC Santa Cruz**
- 6 **MA in Science and Technology Journalism at Texas A&M University**



A quick internet search will give you access to dozens of universities worldwide offering programs in science journalism at different levels, some with full or partial scholarships available.

Along with universities, there are various international institutes and organizations that will provide you with the information and skills required to master science journalism, as recommended by the famous Knight program: ¹⁶

The Nieman Journalism Lab, a project of the Nieman Program at Harvard University, which reports on and explores new and evolving models of journalism. Includes analysis of new technology, trends, recommendations, and an encyclopedia/archive.

● <https://www.niemanlab.org/>

The Open Notebook, a non-profit supported by the Burroughs Wellcome Fund and The Knight Science Journalism Foundation, which features advice, interviews, and how-to guides for science journalists. Also includes a database of feature story pitches, so new writers can learn how to pitch science features.

● <https://www.theopennotebook.com/>

The Poynter Institute, a website maintained by the Florida-based Poynter Institute, provides general media news, trend and tool analysis, webinars, and other training opportunities.

● <http://about.poynter.org/training>

Storybench, a collaboration between Northeastern University's School of Journalism and Esquire Magazine, assesses and offers information on digital journalism, from data visualization projects to interactive documentaries.

● <http://www.storybench.org/>

Pitch Publish Prosper, the online resource for The Science Writers' Handbook.

● <http://pitchpublishprosper.com/>

Investigation in Science Journalism

The AJMI has already published various handbooks and articles on investigative journalism, which will equip you with the knowledge you need to become an investigative journalist.

In normal investigative journalism, politicians, pressure groups, and parties are the metaphorical “enemy.” In scientific investigations, you are likely to face up against lobbies: industrial companies, businessmen, government institutions, or laboratories that do not want the public to know the truth. As in traditional journalism, scientific investigation requires a critical eye, a keen mind, and a determination to follow through. Secret experiments, commercially motivated promotion of particular products by scientists, corruption, cover-ups of health risks – these are hardly uncommon, and make investigative science journalism a vital necessity.

The tools of investigative journalism in the realm of science journalism are much the same as in traditional journalism, but the environment in which they are used is very different. A science journalist typically deals with issues that require specialist knowledge, and finding that first clue can be much more difficult than in traditional investigative journalism.

In Western countries in particular, science journalism has made significant advances, with a distinct move in recent years toward investigative journalism. More than one Hollywood film has been made about these investigations: *Concussion*, for example, which follows journalists looking into long-term brain injuries sustained by American football players¹⁷, or *Dark Waters*, which depicts the poisoning of humans and livestock by a nearby chemical plant making cooking equipment.¹⁸

Stories of this kind are still unfamiliar in the Arab World. But the coronavirus pandemic has encouraged Arab journalists to take their first limited steps into the world of scientific investigation. Over the last few months, many journalists have broken stories of corruption in the supply of coronavirus tests. And the pandemic has also meant that doctors and other experts have been called upon to act as correspondents, explaining to the audience the nature of the virus and how to protect themselves against it.

17 - [https://en.wikipedia.org/wiki/Concussion_\(2015_film\)](https://en.wikipedia.org/wiki/Concussion_(2015_film))

18 - [https://en.wikipedia.org/wiki/Dark_Waters_\(2019_film\)](https://en.wikipedia.org/wiki/Dark_Waters_(2019_film))

Final Word

The unprecedented availability of scientific information today makes the role of science journalism even more important. But the real challenge is not just to access this information but to understand and verify it. This is the job of the science journalist.

In the Arab World, the rise of science journalism is a relatively new phenomenon, although in the West it is somewhat older. It is part of the development of journalism as a whole: the challenges that journalism faces have meant that science journalism has been advanced both as a need and as a solution.

Science journalism is a future-proofed profession that is unlikely to disappear any time soon – a profession that artificial intelligence cannot replace. It is a specialization that can make a radical contribution to our intellectual growth and to our individual and collective impact.

Einstein is often (erroneously) claimed to have said that “if you can’t explain it simply, you don’t understand it well enough.” Whether the famous physicist said it or not, science journalists would do well to bear it in mind.



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Editing:

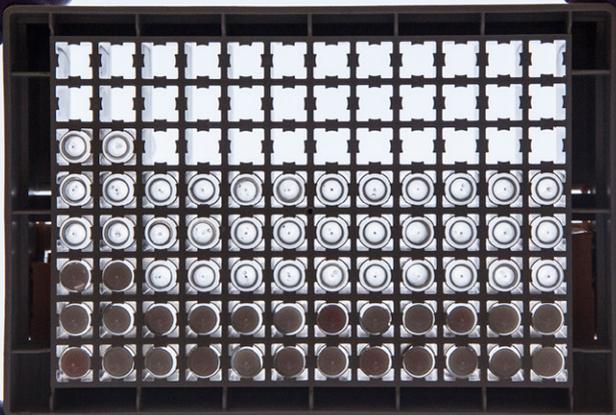
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