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Sharing Our Vital Science
Observations of a Public Geologist

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PRESIDENTIAL ADDRESS

Sharing Our Vital Science: Observations of a Public Geologist*

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*The following piece endeavours to capture the content of the Presidential Address presented at the Kingston GAC–MAC in May, 2017. The accompanying images are selected from the many slides with which the lecture was illustrated.

INTRODUCTION

What is a presidential address? From those I have attended in the past, addresses seem to fall into two general categories: an address is either a description of the president's science and its significance and implications, or it presents wisdom and experience on some topic of broader import, such as the need to volunteer, or the importance of geology in the modern world. While I find my own science supremely fascinating, I suspected that more than a few of you might not want to hear a 50-minute exposition on fossil jellyfish; I have thus chosen the second approach.

My research is very much at one end of the spectrum of Canadian geoscience – or perhaps beyond the end of the spectrum, to the extent that I thought about calling this talk 'Observations of a Resident Alien.' I actually trained initially as a biologist – an ecologist/systematist – and my research career has been spent examining extinct marine invertebrates, with a focus that has migrated from corals to trilobites to stromatoporoid sponges to weird arthropods and jellyfish. I love to talk about all of these, but the fact is that over the past two decades I have spent a considerable amount of time sharing science with the public and the media, as much as developing my own science.

As an employee of a provincial museum, I have participated in a broad range of outreach experiences. There are times when I discuss my own science with the public and with media, but I also develop exhibits on a variety of geological topics, give lectures, run workshops, lead fieldtrips, write blogs, promote exhibits that come to us from outside, and answer many inquiries from the public. This is driven by a need to reach an audience, educate, and attract visitors to the Museum, not by a particular industry sector or political interest. Over the years, I have responded to many public inquiries and dozens of media interviews.

So this presentation is really a summary of things I have learned about engaging the public and media in scientific conversation, suggesting some approaches that seem to often work, and discussing other approaches that definitely do not. The public and media are very different creatures, and one must handle them differently. Members of the public can just walk through the door, so one is often not prepared to talk to them, but they are also frequently open and interested. Conversations with the media usually occur as part of an event or campaign, such as the result of a press release; since this is 'work' for members of the press, their expectations may be quite different.

In preparing this lecture, I appreciated that many members of the audience perform outreach in one form or another, and I anticipate that most people reading this article will also be engaged in outreach. I suspect that much of the material presented below will come across as 'motherhood,' but I hope that the text will include at least one idea or observation that is useful to you.

WHAT IS OUTREACH?

Outreach is a broad and general term: it really does mean reaching out to and engaging community or communities. Outreach includes media interviews, active public communication in the form of social media, articles, or exhibits, and formal venues such as EdGEO, Mining Matters, geoparks, and interpretive lectures. But outreach also encompasses informal talks with friends or family, or perhaps writing an article for the internal newsletter of your company or organization. In some sense we all do outreach, whether or not we think of it as such.

Why should it be important that we reach the public? Isn't it enough that we publish professional science for the consumption of our peers, teach our university students, or prepare reports for the benefit of our industry? In simplest terms, many people have a desire to learn, and many with knowledge have a desire to share, but there is much more to it than that. Outreach has often been aimed at teachers and school students; this follows from basic human curiosity about the Earth, but also from the curriculum's foci on environment and economic resources, and from the need of students to be informed as they decide on future careers. In the modern world, though, outreach goes far beyond teaching the teachers what to teach their students.

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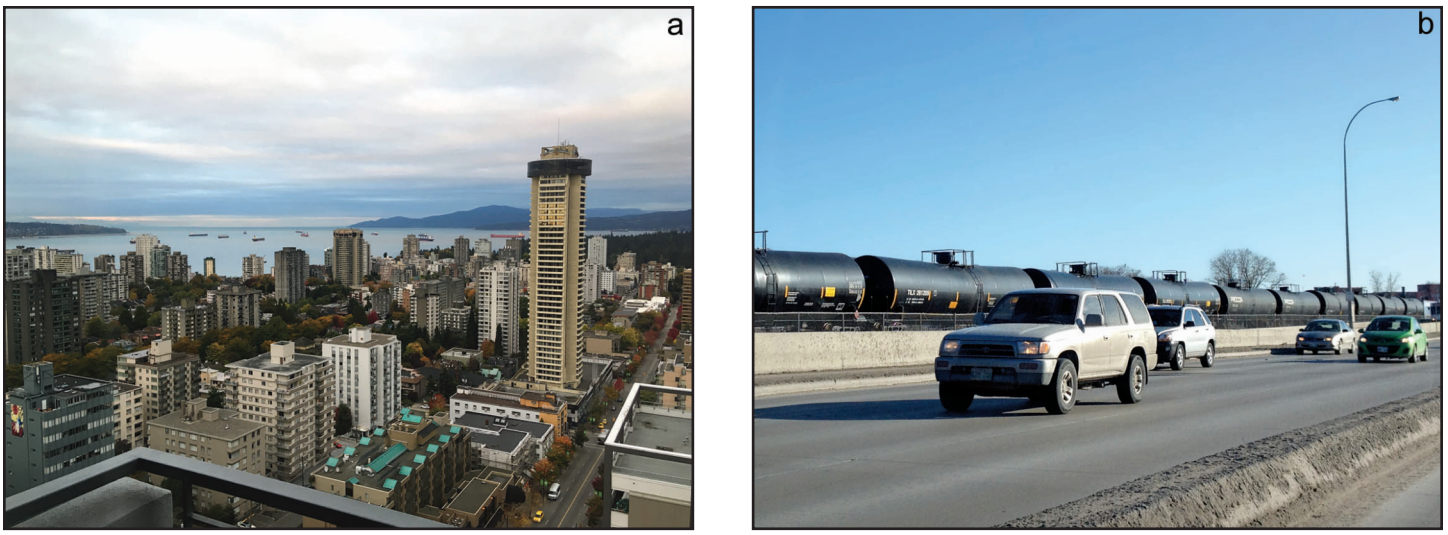

Figure 1. Geological knowledge is critical to many societal decisions. (a) Vancouver's West End and Burrard Inlet: in a city such as this, geology should be considered when planners are determining height and materials for new buildings, or where ships should anchor when they are waiting to dock. (b) Road traffic and a petroleum train near downtown Winnipeg: if we are going to move highly flammable materials across the country, geology is one of the many factors that need to be examined when deciding whether they should be moved by pipeline or by rail.

As geologists it is critical that we should talk to the public in general, because there is so much 'noise' out there in the media world, so much misinformation and ignorance with respect to geology, science, and the Earth. In a democratic society, every engaged citizen is a decision maker, and the sharing of solid science encourages informed decision-making at all levels: individual, policy, political, and corporate. Misrepresentation of the facts can result in bad decision-making, and the wisest environmental or economic decision is not always the obvious one; it could be said that scientific illiteracy bites back. If we share sound science with the public, this will pay dividends when they consider whether to build a house on a floodplain, make personal decisions about the use of energy or materials, or perhaps make voting choices in an election (Fig. 1).

If we are to avoid contributing to the bias problem ourselves, we must recognize that we are also driven by a variety of factors. We are all interested in serving the public and sharing scientific information, but we need to appreciate that our own perspective might be affected by possible financial gain (for ourselves or our employers), maybe by improved visibility and funding of our branch of science, and perhaps even by our political opinions – we need to recognize that we are humans and that our motivations are also mixed and complex.

WHY IS COMMUNICATION DIFFICULT FOR GEOLOGISTS?

As trained scientists we tend to think that good science will be obvious to any observer, since it is usually obvious to us. In thinking this, though, we ignore the extent to which geologists' thought processes are not the same as those of most other people. This significant difference is, in part, related to the sorts of people who are attracted to geology in the first place, but it is also an outcome of our training. Our brains have developed in an unusual way, and the four-dimensional thinking and geological principles that are second nature to us are very foreign to most people. As we travel around the world, geologists do not just see the modern state of each place. Rather, we see how the world has changed to arrive at that modern state. We constantly and subconsciously apply our knowledge of geological time, the law of superposition, original horizontality, plate tectonics, the rock cycle, and all those other facts and concepts that are so deeply embedded in our brains. This is not normal (Fig. 2).

Figure 2. Geologists are different: Nancy Chow, Brian Pratt, and Derek Armstrong discuss and photograph a fossil sample during a field trip to an Ordovician site along the Churchill River, Hudson Bay Lowlands, Manitoba (August, 2015).

Out in the world there is a considerable amount of 'junk science' being promoted by non-scientists, but many of those people are very effective at communicating their messages in words and concepts that the average person can understand. It

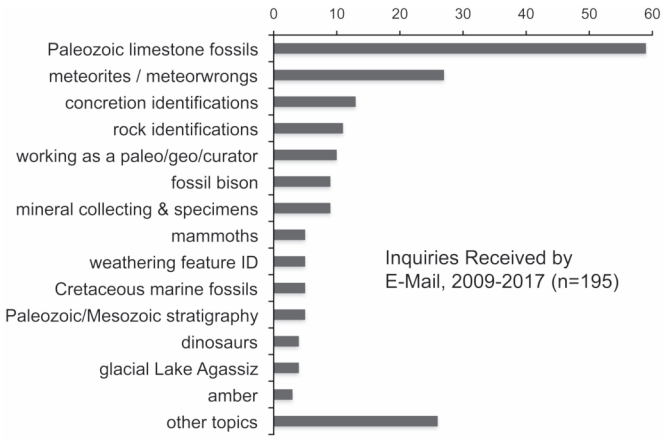

Figure 3. Topics of inquiries received by e-mail for Geology and Paleontology at the Manitoba Museum, 2009–2015 (note: this doesn't include the many other inquiries received by telephone, or walk-in inquiries).

is thus incumbent on us as geologists to learn to better share our knowledge with the public. We need to know how to think on our feet, and to convert complex ideas into simple language. Many of us are *very* focused on our own subdisciplines, and the sort of terminology that we throw around in the lab or field on a day-to-day basis will seem weird and incomprehensible to those outside our science. You will turn most people off immediately if you talk about "a tholeiitic basalt formed by partial melt of peridotite, composed largely of clinopyroxene and plagioclase with minor orthopyroxene," but you may well engage them if you describe "these really important volcanic rocks that are being formed as plates move apart along a mid-ocean ridge."

For the public to become interested in recognizing the importance of our science, we need to consider how *they* think, rather than trying to get them to understand how we do! Context is important and stories are essential because a good story will make the material memorable. Consider what touchstones might link your geological content to the world your audience inhabits: I am still struck by how effective it was, when teaching about dry lakes, to tell my university classes about how the Bonneville Salt Flats were used as the venue for setting vehicle land speed records. Somehow, this minor piece of human history gave them a 'hook' on which they could hang the associated (relatively dry) geological facts.

WHAT ASPECTS OF GEOSCIENCE WILL REACH THE PUBLIC?

When we consider engaging the public in any form of conversation, we need to examine curiosity: what do people find inherently interesting? Curiosity is a basic human trait, and people often want to know about something just 'because it is interesting.' In some cases, it is clear that things that make them curious are things that affect them personally. Where are we going? Will the world change? Will I be employed? Will my children be OK?

Beyond immediate personal interest, there are several other aspects of our science that readily engage the public's attention:

1. *Superlatives* —Many of us immediately think of superlatives as attracting public attention – what we could call the 'Guinness World Records approach.' This is the realm of the very big, very scary, very fast, or very weird. I have heard many geologists say (or grumble) that we need to use dinosaurs to sell our science, and of course the media seem to home in on dangerous geological stories that feature earthquakes, landslides, or volcanoes. Although superlatives grab media attention, they are only a modest portion of what interests the public, as indicated by the topics of inquiries I have received at the museum (Fig. 3).
2. *Local and Concrete Stories* —People are certainly concerned about phenomena that could affect them and their families, but they may also be very interested in things they see or find, even if those things might never affect them in a positive or negative sense. If a person goes out and finds something unusual or shiny, then they will want to know what it is (Fig. 4a).

   Curiosity, like politics, is local, and local geological topics can have great resonance – in Winnipeg, where I work, it is very worthwhile to talk about Tyndall Stone (locally quarried limestone; Fig. 4c, d), about fossils found along Lake Winnipeg, and about glacial Lake Agassiz (which is the cause of our locally horizontal landscape). In any region it is always worth considering these sorts of obvious local touchstones. The geology of well-known buildings is one such touchstone, as demonstrated by the success of the Geology of the Parliament Buildings series in *Geoscience Canada* (Fig. 4b; Brisbin et al. 2005), and of building stone tours of downtown areas.
3. *Fieldwork* —In reaching out to the public, we should never overlook the extent to which most people are interested in the activities of other people. In comparison with some of the other sciences, geology holds something of a trump card in this respect, because we remain a field-based science. We know that fieldwork is often tough, demanding, dirty, and exhausting, but to many outsiders field research is sexy. Fieldwork is real people doing real things, sometimes very strange things in remote or exotic places where they might confront real danger (in Canada, this almost always means bears!). We should make use of this where possible; it is much easier to understand someone riding in a helicopter and hammering rock samples from an outcrop, than it is to make sense of what that person is doing as they prepare samples in a stable isotope lab (Fig. 5).
4. *Left-Field Questions* —People like to be challenged and have their minds boggled, as long as the mind-boggling is not so jarring that it overwhelms them. In talking to the public in Manitoba, I often find that our region's Paleozoic stratigraphy provides a great avenue for engagement. 'Layer cake stratigraphy' is relatively easy for non-geologists to understand, and they can be readily led to a basic understanding of original horizontality, superposition, sediment deposition, and biostratigraphy (Fig. 6).

   Once they grasp these ideas, then they are often shocked when it is pointed out to them that the rocks demonstrate not only that the sea covered much of Mani-

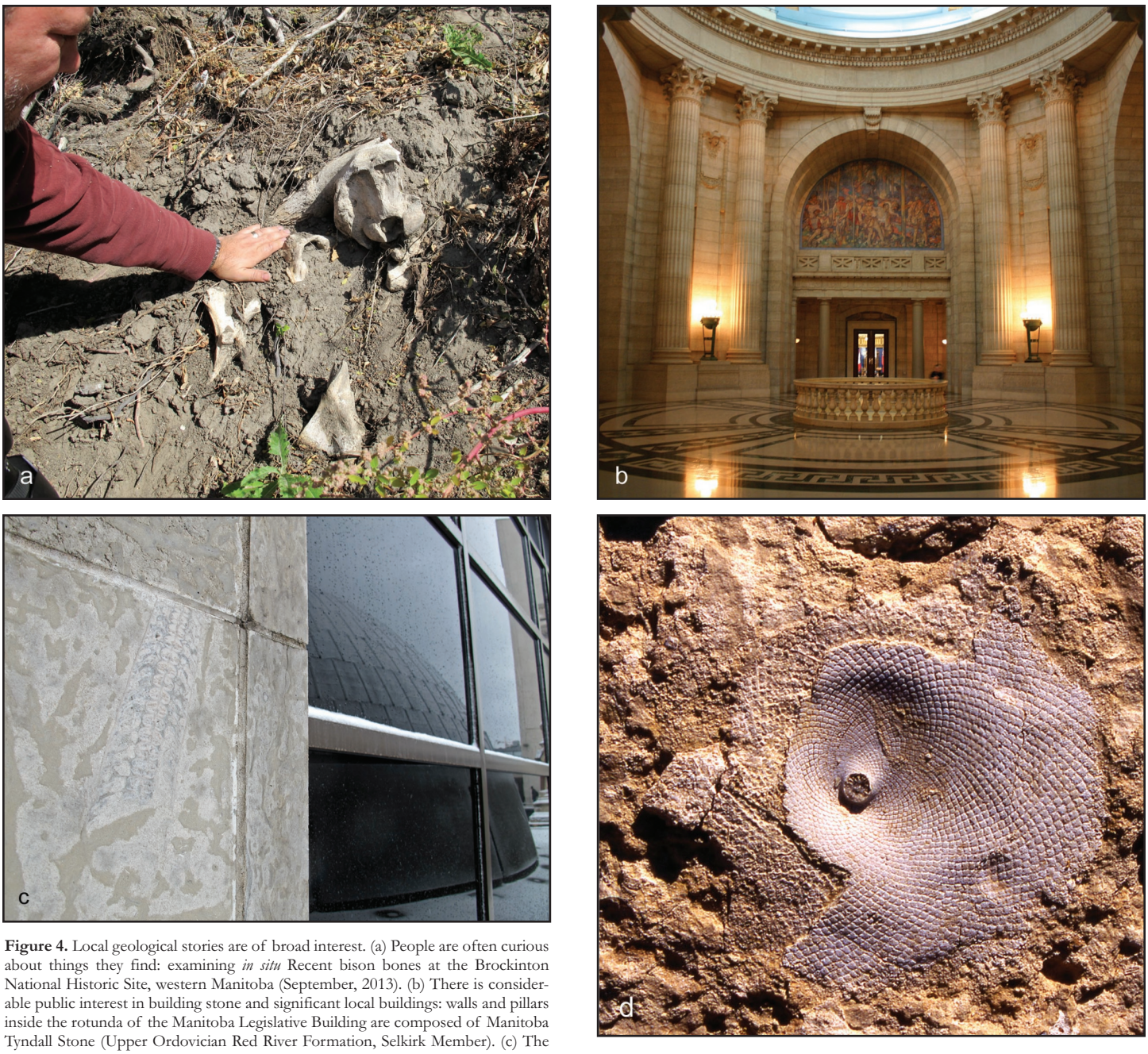

Figure 4. Local geological stories are of broad interest. (a) People are often curious about things they find: examining *in situ* Recent bison bones at the Brockinton National Historic Site, western Manitoba (September, 2013). (b) There is considerable public interest in building stone and significant local buildings: walls and pillars inside the rotunda of the Manitoba Legislative Building are composed of Manitoba Tyndall Stone (Upper Ordovician Red River Formation, Selkirk Member). (c) The exteriors of many Winnipeg buildings are clad in Tyndall Stone, making them a fantastic resource for public engagement: this photo shows a sectioned Ordovician nautiloid cephalopod on the exterior of the Manitoba Museum, with the Planetarium's dome reflected in the adjacent window. (d) The most common large Tyndall Stone fossils are the problematic receptaculitids (genus *Fisherites*), such as this example on a rough surface.

toba in the past, but that it did so repeatedly, rising and falling through many millions of years. Additionally, this was a tropical sea and the fossils and rocks provide good evidence that the town of Churchill was close to the equator 450 million years ago, while Winnipeg was in the Southern Hemisphere. Then of course, the question arises: "How could Churchill have moved so far since then?" Which leads us in a straight line to a discussion of plate tectonics; I will point out that plate motion and speed can be observed in the modern world, and that a plate moving even at that very slow pace can cover an immense distance if sufficient geological time is allowed for.

Thus, once a few appropriate questions are asked, an observation of local layer cake stratigraphy can take us quite readily to global sea level change, plate tectonics, the scale of geological time, and paleogeography. The minds of the participants are boggled, but never to the extent that they are entirely 'under water.'

Figure 5. Geological fieldwork, particularly in remote places, is of interest to many people. Here, a GEM-2 field party walks near the estuary of the Churchill River in the Hudson Bay Lowlands, northern Manitoba (August, 2015).

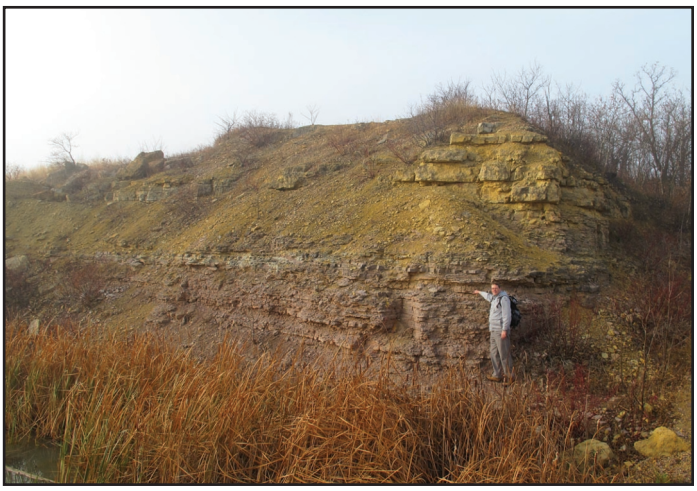

Figure 6. 'Layer cake stratigraphy' is readily understood by non-geologists, providing an avenue to discussion of other topics. Here, Robert Elias demonstrates a contact in the Upper Ordovician Stony Mountain Formation at Stony Mountain, Manitoba (October, 2012).

TALKING TO THE PUBLIC: COMPLICATIONS

Following from the above suggestions, there are numerous potential complications – pitfalls into which the geologist might readily drop as she or he shares science with the public. The first of these stems from the idea that it is essential to use the really popular aspects of geology, such as dinosaurs and volcanoes, to sell the rest of the science. In my opinion, this only works for those subdisciplines in which the relationship is sufficiently close that it will be obvious to the non-geologist.

People do like dinosaurs, and an interest in dinosaurs could well encourage an interest in asteroids, or crocodiles, or the iridium anomaly, or perhaps fluvial sedimentology. But if you make a presentation that contains a considerable amount of dinosaur content, you should not anticipate that your audience will follow you if you suddenly switch topics to massive sulfides or petroleum geochemistry. Any leaps you make should be small and obvious.

If we can't simply jump from 'exciting' things to those things we consider important or essential, we also can't push the important content at people who are not receptive to it. We cannot force people to be interested in a 'worthy but dull' topic, even if the material discussed might intimately affect their lives. In this sort of category, I would include exhibits or web pages that show things like "here is what goes into your cellphone." People, particularly young people, do spend a lot of time looking at their phones, but that doesn't mean that they will be interested in what the device is actually made of. For this topic, and for many others, you really have to find the 'levers;' don't ever force feed facts to your audience. They might well become more interested if you tell them that the metals in a cellphone could become scarce due to the control of the supply by other countries, particularly if they are told that such a scarcity could make it expensive for them to upgrade. The possible levers for many topics may require considerable contemplation on the part of the presenter.

Outreach, whether spoken or written, needs to be approached as a conversation rather than a lecture. The presenter should be open to ideas, to discuss with the audience, to ask them questions, and to encourage them as they themselves develop ideas. To many of us who are used to arguing science with other scientists, this warmer and friendlier approach can itself be a challenge! Humour is often effective, as long as it is relevant to the material being presented.

If we are talking to the public, we also need to take the time to establish context and perhaps to establish the 'rules of engagement.' Most people find a lot of science interesting, but they really don't like it if you push and challenge their beliefs, or challenge outright what they think they know. Evidence of geological time in local landscape features may be useful to point an audience toward an appreciation of the immense age of the Earth, and thus an acceptance that evolution has occurred. Evolution itself is a rather abstract concept and in most cases you really can't see it for yourself, but you can see strata in a roadcut or cliff, and drawing on simple geological principles may lead people inexorably toward scientific conclusions. Nevertheless, if you are discussing topics that touch on religious belief, in spite of your best efforts you may need to agree to disagree with some members of your audience.

It is always good to try to assess your material from the outside. Begin with simple concepts and concrete facts, leading to more complex ideas, avoid jargon if at all possible (and define any word that might not be understood), and try to introduce or discuss just one major idea in each part of a presentation or exhibit. Always consider what approaches could make the material relevant to them, otherwise you might meet the response of "Why should I care?"

One final consideration, when dealing with the public, is to always remember that the public we deal with will be a cross-section of society, good and bad. In my 24 years of handling public inquiries I have met thousands of very nice people, but also a few rather strange people, and one or two quite scary individuals (one of whom was later arrested as a serial murderer). If you are talking to previously unknown people, particularly in one-on-one situations, please always practice safe out-

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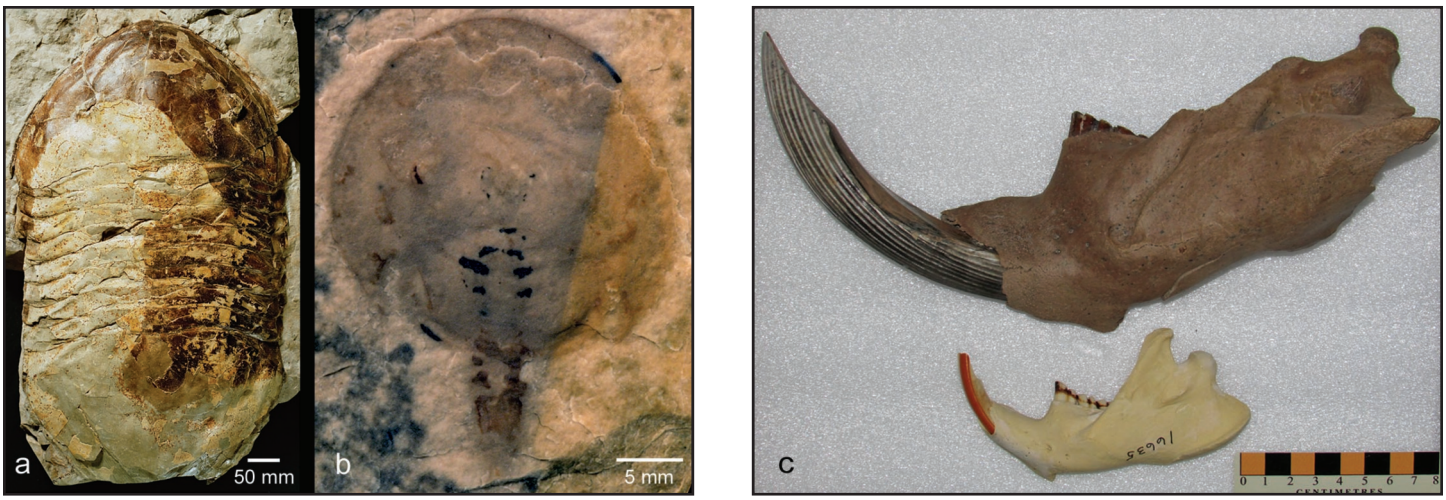

Figure 7. The media are attracted by superlatives; over the years, these three discoveries have provided far more media exposure than any other work colleagues and I have done. (a) *Isotelus rex*, the world's largest trilobite, from Ordovician strata near Churchill, Manitoba (Manitoba Museum, MM I-2950; Rudkin et al. 2003). (b) *Lunataspis aurora*, which at the time of publication was the world's oldest horseshoe crab (xiphosurid), also from Ordovician strata in the Churchill area (MM I-4000A; Rudkin et al. 2008; see also Young et al. 2012)). (c) This huge jaw of the giant Pleistocene beaver *Castoroides,* (MM V-3175) discovered in 2017, is the only element of that unusual creature known from the prairie provinces; here it is compared to the jaw of a modern beaver.

reach: meet them in a public and safe place, and consider a 'blind inquiry' the same way that many people consider a blind date.

TALKING TO THE MEDIA: EFFECTIVE APPROACHES

There is a considerable amount of overlap between talking to the public and doing a media interview. Nevertheless, talking to the media requires special, additional skills and approaches.

When dealing with the media, one must endeavour to be as succinct and clear as possible. Unlike the public, the media tend to be on a tight schedule, and you may not have time to explain or to say anything more than once. You can lose them quickly if you string together too many thoughts, so if possible don't try to deal with more than one idea at a time, and try to limit an interview to just a few big ideas or themes. This obviously depends on the format of the interview: you can cover one idea (or less!) in a 60-second live clip, but quite a few ideas if you have the luxury of 30 minutes in a studio.

As with the public, you need to ensure that you are warm and conversational, and speaking at an appropriate level, particularly when dealing with broadcast media. Gauge your medium and your interviewer: local breakfast television is entirely different from *Quirks and Quarks*! Since the media are often on tight schedules, they like to have the material packaged for them, and they often expect to receive 'push' content. It is good to have your talking points in mind before you begin the interview, and it is even better if you have already supplied a well-written press release along with images, or a blog post or video. In this regard, a good press officer is the best professional friend that a scientist can have.

Unlike most of the public, members of the media may or may not be curious about or interested in the science you wish to discuss. They have their own agendas, and they may be uninterested in or even, occasionally, hostile to your perspective. Always remember that the media like to deal in superlatives: the biggest, fastest, most dangerous, or oldest (Fig. 7). They also are interested in financial value and in relevance to humanity, so you may be required to think about your science in a quite different way.

If you are effective with the media, accessible, and explain things in ways that are readily understood, you may find yourself being considered as a 'source' on geological or even broader scientific issues. Once a member of the media finds someone they consider to be an accessible expert, they may go back to that person again and again for comment, even if the scientist's particular expertise is quite peripheral to what is being discussed. Most members of the media seem to have no idea how big and specialized modern science can be, so you may need to be wary of making pronouncements about things you don't really know. I speak from experience here, as I have cringed to see my 'expert opinion' quoted in certain news articles and books, when I should have simply said "No comment" or "I don't know."

EXHIBITS

If you are considering creating an exhibit about a particular topic, please first ask yourself this question: "Is an exhibit the best medium for this material?" A worthy topic isn't necessarily worthy of exhibit, and the medium is critical. Something that could make a fabulous web page or magazine article might be a very dull exhibit.

Once a general medium is chosen, you should ask yourself more specialized versions of the same question. Is this a specimen-rich exhibit or a touchable piece? Will it only work if accompanied by a video, computer, or other multimedia component? Let the material guide you, and stay open to changing course until some distance into the exhibit planning process.

As a long-time museum curator, I have observed that many inexperienced people think they know how to create exhibits. This is certainly the case for some academics, who tend to have strong opinions about museums and exhibits, but an exhibit is a specialized medium, and it requires thinking that is very dif-

ferent from that needed for a scientific paper. Exhibit text needs to be brief, and if at all possible it should only exist in relation to other exhibit components, such as images, specimens, models, or video. An exhibit that consists solely of panels should be avoided at all costs; museum staff tend to refer to these as "textbooks on legs." Rather, each section of an exhibit should include a specific attraction: a physical object or set of objects, a video, a touchable item, or a digital interactive.

In general, exhibits should focus on real specimens or other objects, at the expense of other exhibit components if necessary. In the modern world, people will come to your museum to see real things in person; they can see anything that is not real (such as an image or computerized content) at home, on their phone or computer. Computer technology can be very useful to tell particular stories, particularly those showing dynamic processes (Fig. 8a), but unless you have virtually limitless resources it is wise to avoid focusing most of your exhibits on digital features. The computers you pay a fortune for will be out of date in a year or two, and will never keep up with the technology that visitors have in their own pockets. Nevertheless, there is certain technology that can greatly enhance the impact of an exhibit: modern lighting and case design approaches have revolutionized the appearance of many exhibits over the past decade or so (Fig. 8).

Figure 8. Some examples of the geological exhibits developed in the past few years at the Manitoba Museum. (a) The *Ancient Seas* exhibit uses a large three-screen animated projection to depict Ordovician marine life in the Churchill area; the fossils on which it is based are shown in adjacent cases (installed 2010). (b, d) A case of minerals from the Canadian Shield utilizes fibre optic lighting and low-iron glass to show mineral colours to best advantage; the minerals float on sheets of specially-treated acrylic atop black metal plinths (installed 2012). (c, e, f) Recently installed vertebrate fossil exhibits include (c) the original fossil of a Cretaceous pliosaur, which is panel-mounted as though exposed in bedrock, and lit from above with a gated LED fixture; (e) a resin reconstruction of the same pliosaur, suspended from the ceiling and lit with theatrical LEDs; and (f) a complete remounting of the *Megatherium* and glyptodont, which have been on exhibit at the Museum since the 1970s, but are now on a stained hardwood plinth and lit with theatrical LEDs; the style of this exhibit is in reference to the fact that these are historic 19th century replicas (installed 2016).

Following on from these thoughts about technology, it is worth your while to think of any exhibit component in terms of 'time proofing.' If you are depicting dynamic and changing science, ensure that labels or panel copy can be readily updated at modest cost. Can new photographs or diagrams be inserted as they become available? Choose classic or timeless colours and fonts, rather than going with the 'flavour of the moment.' Many exhibits last for at least a decade or two, and you don't want your exhibit to be the visual equivalent of a kitchen that has its age betrayed by 1970s harvest gold or avocado-coloured appliances.

As is the case for dealing with the media, an exhibit should be approached with the intent of presenting big ideas in simple

ways. Reduce your text to the simplest words that still get the ideas across clearly, and ensure that your schedule permits ample time for revision and editing. Consider the general principles that apply to all outreach: make your material familiar, make it local, or make it big, weird, gorgeous, or dangerous!

BLOGS

As with exhibits, blogging requires its own special approach. While I have little wisdom to contribute with respect to most social media – such as Twitter and Instagram – I have done a lot of blog writing over the years, and have developed strong opinions on what does or doesn't work. Some of this has been for work, as the museum has experimented with various blogging platforms and approaches, but I have also maintained a personal scientific/nature/landscape blog sporadically since 2009 (www.ancientshore.com). During the development of this varied experience, I have produced at least 200 blog posts, and have accumulated a huge volume of data on what has or hasn't been effective (based on about 300,000 views on the personal blog).

There are relatively few long-term Earth Science bloggers in Canada, and many of the long-standing blog pages seem to be institutional in nature. Even when it is being done for an institution or organization, blogging is a personal medium, and to reach a wide audience you need to be accessible and conversational, as well as scientific. When writing a blog post on a particular topic, develop your individual perspective or angle; it is rarely effective to approach a topic or issue head-on. Many members of your readership will be there simply because of personal interest, so it is important to entertain them while sharing information that has substance.

If you consider setting up a blog on a particular topic or theme, please be aware that blogging, like owning a pet, is a long-term commitment. It is worthwhile to define your purpose before starting a new blog; some sort of mission statement is not a bad idea. As a blog develops, it can change directions depending on the interests of the writer and the readers. With that in mind, it is worthwhile to keep track of data on what is read, and by whom. Considering my personal blog, there has been substantial readership on post topics including zoology, vertebrate paleontology, museum exhibits, marine biology, invertebrate paleontology, photography, regional geology, sedimentology/stratigraphy, and art. These reflect the reasons people visit that page, but they also demonstrate a genuine diversity on the part of the readership. Although a scientific blog should have a particular theme, a variety of material is more likely to attract a broad readership. You should think about readers in global terms: since the Internet is everywhere, your readers could be anywhere, not just in your city or region.

If you do consider starting to blog, it is worthwhile to study the medium before leaping in. Much of blogging success is not directly related to what you write; it is also essential to locate a blog to attract readers (don't bury it several layers down in an institutional or society website), and enhance access by encouraging readers to subscribe to your feed, link to and from other pages, encourage others to repost your material (with links), and encourage comments and discussion. The Internet is a visual medium, so a blog should have a strong and distinctive look, and photographs or other images are critical components of success.

Although content and substance are essential, this must somehow be transmitted with some brevity. At one point in our development of museum blogs, it was suggested by a marketing expert that we should do posts of about 300 words. While I have found that it is impossible to really say anything of substance in such a short piece, 700–1000 words may well be optimal for a readable post on a scientific subject, and it is unlikely that many readers will take the time to read a 2000-word piece in that format (note that quite a few of your readers will be squinting at the small screens of phones or tablets!). In addition to brevity, frequency is also essential. A blog post should not be seen as a 'one off;' rather, it needs to be a piece in an ongoing stream of content. Many scientific blogs are updated only sporadically, but real audience growth is likely to happen if you can manage to post every week or at least every two weeks, since it is easy to lose readers if their visits don't become a habit.

SOME FINAL THOUGHTS

Respect your audience, and always remember that communicating science to the public is like a conversation. We are the experts, but we also need to listen. We need to find simple ways to explain complex ideas and phenomena: storytelling is essential to most forms of outreach and metaphor and humour are your friends. Geologists think in a different way, but that is not a bad thing, and we can make use of that difference as we share our understanding of the world around us!

Over the years I have learned much from many geological colleagues and students, particularly in the field and laboratory, and also from members of the public with whom I have interacted. I am very grateful for the wisdom they have shared with me. I thank the Geological Association of Canada for providing the opportunity to serve as its president and to present this address.

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