Science Communicators as Commercial and Social Entrepreneurs

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Abstract Science communication provides many opportunities for budding entrepreneurs. This chapter explores two often-overlapping types of entrepreneurship – commercial entrepreneurship and social entrepreneurship, focusing on science shows as a science communication medium. In the first section, commercial entrepreneurship is discussed, beginning with the typical transition most entrepreneurs make from larger organisations to being self-employed. Aspects of commercial entrepreneurship are then considered, including cultivating relationships, marketing, customers, grants, sponsorship, in-kind support and a key entrepreneurial characteristic: spotting and seizing opportunities. The section ends with a reminder that programme quality, not profits, should be the focus for sustainable activities. The chapter then moves to social entrepreneurship, e.g. how science communication can improve lives, address human health problems or help the environment. Examples of such approaches in science centres and shows are reviewed, and research on two science shows is discussed in detail: an HIV AIDS show in South Africa and a climate change show in Australia. The research illustrates that science shows can be effective tools for the social entrepreneur to foster motivation and behaviour change in audiences and address community problems. The stories of two inspirational social entrepreneurs working in science communication in the developing world are then discussed. The chapter concludes with a call to action for science communication – especially science centres and shows – to play a greater role in addressing societal problems.

You are unlikely to get rich doing science communication; however, for those drawn to it as a passion and profession, that is not the aim. As an emerging discipline academically and in practice, the entrepreneurial flame burns in science communicators, whether working independently or within organisations. Struck

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with opportunities to communicate science in new and exciting ways, science communicators regularly find themselves searching for funding to initiate research projects or outreach programmes or scrambling to create revenue via science communication activities. It sounds challenging. It is. So why and how do we do it?

This chapter explores two answers to this question: first, to create a job one is passionate about that makes a reliable income, and second, to make the world a better place. These two dimensions of entrepreneurship – traditional commercial entrepreneurship and social entrepreneurship, respectively – underpin many science communication activities. The chapter begins by looking at commercial entrepreneurship, how practitioners can create innovative businesses communicating science. Literature in this area is virtually non-existent, so I draw on my own experience as an entrepreneurial science show presenter in Australia and internationally, along with examples from the United Kingdom and United States where numerous individuals and small businesses operate.

I then move to the main focus of the chapter: social entrepreneurship. As science and society increasingly overlap with issues like climate change, health and the environment – common topics for science communication – opportunities to make a positive contribution to these issues become salient. Recognising, evaluating and acting on these opportunities to do social good is a central feature of social entrepreneurship (Lehner & Kansikas, 2012). I will review some examples of social entrepreneurship in science centres and then science shows and theatre – the main science communication activity discussed in this chapter. Recent studies on two science shows are then discussed: an HIV AIDS show in South Africa and a climate change show presented in Australia. Both studies provide evidence that science communication activities can make a positive contribution to society and that science communication is a fruitful, worthwhile pursuit as a social entrepreneur.

Traditional Entrepreneurship

It is not surprising that Sir Richard Branson, the entrepreneur behind Virgin, chose airlines, phone networks, credit cards and even balloon flights as ways to make money, yet overlooked science communication. One is unlikely to get rich quickly, or even rich at all, as a science communication entrepreneur; however, the other rewards are arguably more valuable than money. The chance to build an enjoyable, rewarding job and – they hope – a career doing what they love is what drives most science communication entrepreneurs. Certainly, there is the potential to grow – such as Steve Spanglers' science education 'empire' in the United States – but if one's primary aim is to make money, then they should best look elsewhere than science communication.

Most science communication entrepreneurs begin their journey training and working for larger organisations – typically as science teachers or science centre staff. This stage in the entrepreneurial journey is critical, as it gives skills, experience, contacts and credibility to the individual, without which the idea of going solo

is difficult if not impossible. My own story started with the Shell Questacon Science Circus, an outreach and academic programme run by Questacon – Australia's National Science and Technology Centre and the Australian National University – and subsequent employment by both organisations. The Circus provides knowledge of the skills and theory of science communication, coupled with the real-life experience of delivering science programmes in schools and the community. Similarly, science teachers complete tertiary studies on educational theory and teaching practice and go on to classroom teaching. These skills and experience are critical for future endeavours of a science communication entrepreneur working in science outreach and shows.

Established programmes run by well-known, trusted organisations give future entrepreneurs another essential ingredient: credibility. To be welcomed into a school, or invited to perform at a community event, people need to know they can expect quality – credibility by association is an asset here, as are the contacts one makes while with the organisation. Wise science communication entrepreneurs will remember who gave them their start, both in gratitude and as a source of future opportunities.

Budding entrepreneurs leave these organisations or begin seizing private opportunities in addition to regular employment – a good option to minimise the risk inherent in entrepreneurship. In one of the few articles on science communication entrepreneurship, US-based science show presenter Robert Krampf (2001) describes his turning point as follows:

After 13 years of presenting science shows at a museum in Memphis, Tennessee, I was having a bad day and suddenly realized how much revenue I was generating and how little they were paying me. A week later, I handed in my notice and went into business for myself. (p. 4)

This story highlights several of qualities of entrepreneurship, be it in science communication or other fields. According to Gedeon (2010, p. 22) 'the distinguishing feature of the entrepreneur is alertness to disequilibrium, or asymmetry of information, in order to create profitable opportunities'. Krampf is just one of several examples of where people see opportunities for better and more equitable pay, less bureaucracy, better conditions and other areas of 'disequilibrium' when working for a larger science communication organisation. Other common drivers for entrepreneurs are opportunities for more freedom and greater creative control, as illustrated by Wendy Sadler (personal communication, November 30, 2012), the Director of 'science made simple' and one of the United Kingdom's foremost science communication entrepreneurs:

From a background in science centres, I started a business because I wanted to have more creative control over what I produced and develop more physics-based outreach shows for schools who may not visit science centres.

For those looking to make the transition to entrepreneurship, Krampf provides a rarely documented insight into running a business delivering science shows. This includes aspects beyond the scope of this chapter such as logistical advice, employing staff and what makes a 'good' science communication product or

service, in his case a show. He also highlights some of the many challenges of being a science show entrepreneur, beginning with where to begin.

Establishing a presence, credibility and professionalism are the first steps that determine the success of future entrepreneurial ventures. These elements underpin *relationships* – a critical element of a sustainable business. In my experience, aspects such as having a website, business email address, business cards and other features that say you are a professional are especially important.

Along with establishing a presence is marketing. Effective advertising depends greatly on individual contexts, so I am hesitant to provide thoughts regarding promotion. Nevertheless, experience suggests that the less formal (and often free) avenues are most productive. Word of mouth, chats after shows, awareness within networks (e.g. science teachers) and performing at big, diverse events are the methods I have found most rewarding. Most critically, the best marketing is to provide quality science shows (or other communication activities) along with a friendly and enthusiastic manner.

'Income' for a science communication entrepreneur comes in different forms; I will focus on three: (1) fees from customers who book shows and services, (2) grants and sponsorship and (3) in-kind support. Typical customers include schools, science centres and museums, other public facilities, science and nonscience special events and other organisations providing programmes for youth. Key characteristics of these groups are presented in Table 1. Providing a good range of quality, value-for-money programmes will foster repeat customers – another area where building relationships is important.

The second major source of income is grants and sponsorship from corporate and government sources. Often the terms and conditions around grants prevent them from being direct sources of revenue for day-to-day activities; however, they can allow the purchase of equipment or overheads for special events and audiences. Corporate sponsorship is another avenue, especially where the science being communicated aligns with their business, such as water or energy providers. The nature of entrepreneurship is to seek out these opportunities (Shane & Venkataraman, 2000), which are often not formally promoted, and then be creative to align one's programmes with the aims of the sponsor or grant provider.

In-kind support is a major asset for science communication entrepreneurs, especially while getting established. Typically this takes the form of logistical support, for example, a partnership with a local university may provide access to chemicals and liquid nitrogen. Larger science-related organisations can also help with endorsements to establish credibility, promotion, venues for performances and so on; however, the entrepreneur needs to establish what benefits they can provide in return.

As noted earlier, spotting opportunities is key to entrepreneurship and suggests ways to diversify activities and tap new markets once the initial science communication entrepreneurship activity is established. Eckhardt and Shane (2003, p. 336) define entrepreneurial opportunities as 'situations in which new goods, services, raw materials, markets and organizing methods can be introduced through the formation of new means, ends, or means-ends relationships'. This definition

Table 1 Typical customers for a science communication entrepreneur delivering science shows and similar programmes

Customer group	Characteristics
Schools	Usually broken into primary and secondary levels, each requiring a different approach. Issues such as curriculum relevance and timing during the year (e.g. away from exams) become more critical as student year level increases. Teachers can sometimes form a distinct customer group
Science centres and museums	Although they may be in competition with the science communication entrepreneur, good relationships and a unique product can facilitate useful partnerships
Other public facilities	Libraries, community centres and children's wards at hospitals are all in need of good-quality education programmes; however, discretion is required as to the appropriate charge – if any – for different groups
Science and nonscience special events	Larger events such as science weeks or festivals, or general community events such as major events can reach new audiences – including, importantly, those who don't usually engage with science
Other organisations providing programmes for youth	Groups running after-school care, holiday programmes or other youth organisations such as the Scouts (Krampf, 2001)

suggests many avenues for science communication entrepreneurship, with a key point being that they embody either *new* ways of doing things, new outcomes from those things or both – one must innovate.

Eckhardt and Shane's definition captures many examples of entrepreneurship available to science communicators. For example, groups such as CSIRO's Double Helix Science Club in Australia have turned archives of science activities into commercial science kits, even partnering with a wholesale supplier to reach a wider market. Experienced science show presenters also offer training to other practitioners, workshops for teachers or workshop and show development for other organisations. In some cases the breadth of entrepreneurial opportunity for a science communicator is surprising; for example, science show researcher and presenter Dr Paul McCrory also provides public speaking and communication training to universities and businesses (see www.learn-differently.com).

McCrory (personal communication, November 28, 2012) also raises a serious consideration for anyone considering entrepreneurship in science communication: balancing the need to create profit with the obligation for quality science communication and in the case of school customers, educational effectiveness. As Krampf (2001) notes, science outreach programmes visiting schools have the potential to generate substantial revenue. It can be a slippery slope to focus on the profit, thereby compromising programme quality to maximise such profit, rather than on the joy and satisfaction of being a self-employed science communicator who takes pride in one's work first and foremost. A focus on the latter is more likely to create a sustainable entrepreneurial model, sound educational outcomes and not

compromise the reward of having a worthwhile and fun job. Moreover, it does not rule out being profitable – rather, I've found, it facilitates it.

The most rewarding shows for all concerned will often cost the entrepreneur rather than the audience, but bringing some science to sick children in a hospital is a cause that any ethical science communicator should find worthy. Indeed, science communication has far more to offer social entrepreneurs than commercial ones. That said, social entrepreneurship is an area in which commercial science communication entrepreneurs arguably operate, especially when providing educational services.

Social Entrepreneurship

As a science communicator, commercial and social entrepreneurship often overlap: one may make a profit providing science shows to schools, but they also provide an innovative form of science learning and contribute to society. This is common more broadly in entrepreneurship, where commercial endeavours have social outcomes and vice versa (Emerson & Twersky, 1996). In essence, social entrepreneurship is about using the skills of an entrepreneur – identifying and making the most of opportunities – to make the world a better place. Certo and Miller (2008) define it thus:

Social entrepreneurship involves the recognition, evaluation, and exploitation of opportunities that result in social value – the basic and long-standing needs of society – as opposed to personal or shareholder wealth (Austin, Stevenson, & Wei-Skillern, 2006). Social value has little to do with profits but instead involves the fulfillment of basic and long-standing needs such as providing food, water, shelter, education, and medical services to those members of society who are in need.

Although this definition focuses on helping people, entrepreneurship to address environmental problems is often placed under an umbrella of social entrepreneurship (Certo & Miller, 2008). The rise in activity in this area is, however, creating a field in its own right (Dean & McMullen, 2007) – even spawning the term 'ecopreneur'. Science communication (though not always named as such) has long operated in both areas, mainly through entrepreneurial activities to address human health and environmental issues, which are the focus here. These programmes typically aim for social or behavioural change, which is not a common approach amongst science centres and rarer still amongst science shows.

A small number of investigations have been carried out concerning science centre exhibitions focused on the environment (e.g. Sutter, 2008) and health-related initiatives with a behavioural focus. Cartmill and Day (1997) found a visit to a museum exhibition about illicit drugs, including an exhibition, film and, notably, a presentation or show, significantly reduced intention of drug use. Effects persisted two weeks following. Other studies on the travelling exhibition *Body Worlds* have found similar results, with changes in intention being recorded for various health

behaviours, including smoking, healthy eating, exercise and dental care (Carney et al., 2009).

Science shows in particular can be effective tools for the social entrepreneur because their creation requires fewer human and financial resources compared to formats like an exhibition; they can be taken to locations where the problem exists; they are adaptable to many topics, provide a personal connection with the audience and can readily be replicated and taught to others. Most importantly, science shows can influence behavioural intentions, including in difficult areas such as HIV AIDS (Walker, Stocklmayer, & Grant, 2011) – this research is discussed below. Similar demonstration-based shows have also been used to communicate HIV AIDS in Germany, however, with more focus on the science and less on social and behaviour change (Korn-Müller, 2012).

Demonstration-based science shows aiming for behavioural change are, however, quite rare, with providers usually opting for traditional theatre approaches when tackling social issues. Many performances of this type address environmental issues, for example, sustainability, recycling and climate change (e.g. Our Planet Enterprises, 2008). Health messages are also a common theme, e.g. the Liberty Science Centre in the United States used a laser show *Extreme Choices* and traditional theatre play *Hot Air* to communicate anti-smoking messages to school students (Koster & Baumann, 2005). Evaluation showed the show and theatre piece communicated anti-smoking messages effectively, with students understanding the negative health consequences of smoking and the importance of their choices (ibid.).

Many social issues are ripe for science communicators to tackle – diabetes, HIV AIDS, tuberculosis, obesity, climate change, sea level rise and pollution are all of concern in the Pacific (Russell, 2009) and around the world and require innovative solutions. Science communication activities such as science shows or travelling exhibitions often represent novel, creative ways to address such problems – entrepreneurial solutions – and there is evidence to suggest they are effective. I now turn to two case studies to illustrate this: an HIV AIDS science show in South Africa and a climate change science show in Australia.

The Alarming AIDS Adventure

The Alarming AIDS Adventure science theatre show was presented at the University of Zululand Science Centre in South Africa's KwaZulu-Natal province – an area with some of the highest rates of HIV anywhere in the world (Welz et al., 2007). The science centre almost exclusively services urban (township) and rural school groups, as opposed to the general public, with most visitors coming from disadvantaged socioeconomic backgrounds. The centre features interactive exhibits, science shows, workshops and programmes typical of a contemporary science centre; however, it began adding HIV-related initiatives in late 2009.

The programme is a perfect example of social entrepreneurship in science communication. The centre director Derek Fish saw a problem and an opportunity to address it in innovative ways. He then mobilised resources, primarily from international collaboration with the Australian National University and financial support from the Wellcome Trust, and implemented a solution which resulted in positive changes in the community. In fact, the programme acted on numerous opportunities: the science centre saw many secondary students; secondary students represent an ideal intervention point as they are becoming sexually active; the centre had talented presenters and show facilities; and there was a nearby HIV research centre open to collaboration. This mix of opportunities produced fertile ground for an innovative solution. Here, I focus on a science theatre show that formed the major HIV intervention component; however, it also included other activities such as games and a career advice session.

The shows were presented by two local science centre staff – one playing the role of a curious student, the other a 'scientist' character – either in English or isiZulu language, depending on the audience. Basic evaluation was first conducted to ensure it was well received by students, and feedback was gathered from local HIV AIDS workers/scientists and Zulu science centre staff. When tackling social problems it is critical to understand the problem from the perspective of those who require the help and ensure the solution is culturally and practically appropriate and – for science communication – is also scientifically sound.

Promoting safe HIV AIDS behaviour was the dominant show theme; however, humorous and entertaining material was interspersed with serious messages to ensure students remained engaged and had a positive experience overall. The show used tools familiar to many forms of science communication, such as multimedia, props, analogies, narrative, drama and demonstrations. We structured the show around the HIV acronym, but in reverse. Section one discussed viruses, while section two explored the immune system with reference to HIV. Section three was critical to addressing the problem: the human aspect and safe, unsafe and misconceived behaviours. This was presented by 'scanning' two hypothetical people who had engaged in different behaviours related to HIV. The presenters and audience were then 'shrunk' and travelled in a submarine-like ship into the person whose 'scan' showed unsafe behaviour. The view from the ship's cockpit, projected onto a screen, eventually reveals a view of HIV in the blood. Multimedia showed the shrinking, biological aspects of HIV and action of antiretroviral drugs, while physical models and demonstrations showed the role of RNA and other features of the virus. The show then discussed several social aspects of HIV AIDS, such as destigmatising the condition and encouraging testing.

The show concluded with a large demonstration where mixing fluids in glasses was used as an analogue for mixing bodily fluids during sex – the main method of HIV infection in South Africa. Twenty volunteers each had a glass of water, one of which had sodium hydroxide (a strong base) added to it to represent being HIV positive. Like HIV infection in a person, the presence of sodium hydroxide dissolved in the water is not visible. Depending on a behavioural instruction on each glass (e.g. abstain from sex – do not share fluids with anyone), volunteers

either exchanged fluids with everyone, a single partner or nobody. It was critical to stress that fluid mixing served as an analogy for exchanging bodily fluids during sex. Finally, acid-base indicator was used as an 'HIV test'. The result – a colour change – showed how the virus spreads based on behaviour. This was the show's key message.

Surveys collected ($n = 697$) before and after the show demonstrated it was able to significantly improve intended behaviour across a range of risk and prevention behaviours. This research is reported in detail in Walker et al. (2011). Across the 15 behaviours measured, 9 significantly improved including the desire to learn more about HIV, discuss HIV with family, resist peer pressure, abstain from sex and have self-confidence to behave safely. Intention to use condoms, have an HIV test and talk to friends and measures of being concerned about HIV or thinking unprotected sex was OK did not change significantly; however, it did indicate 'safe' intended behaviour or attitudes. The unchanged items presented opportunities both to improve the survey instrument and the show. In sum, the study shows that science communication activities – in this case a science show at a science centre – can be effective forms of social entrepreneurship and help address difficult problems.

Sustainability! The Climate Change Show

The main focus of this show was on ways people can help address climate change, both in their everyday lives (e.g. choice of fuels, using renewable energy) and to a lesser extent through science and technology (e.g. carbon capture and storage, hydrogen fuel). It also included a short introductory section on what climate change is, the greenhouse effect, the gases involved and their sources and two of the potential impacts of climate change. Demonstrations were used throughout to convey information and model/reinforce target behaviours.

Two demonstrations on climate change impacts have particular relevance to the Pacific: (1) the role of thermal expansion of water in sea level rise and (2) the effects of carbon dioxide on ocean acidification. Both of these demonstrations are straightforward to replicate, so I will describe them in more detail here. Sea level rise is a serious problem globally, but especially for low-lying islands throughout the Pacific. People often hold the misconception that sea level rise is due to melting ice caps and glaciers; however, approximately half of the effect is due to fact that water expands with temperature (IPCC, 2007). A simple apparatus can be made to show this by taking a cork, inserting a long, thin transparent plastic tube through it lengthways and then inserting the cork into the neck of a glass bottle (darker coloured glass works best). The bottle is filled to the brim with water containing food colouring for easy visibility as it travels up the tube. A heat source (a lamp, the Sun, hot water) is then used to warm the bottle, causing the water to travel up the tube due to thermal expansion. The demonstration is a good analogy for the effect of a warming planet on our oceans.

Second, ocean acidification is a particularly relevant issue for the Pacific region due to its negative effects on corals. The method of acidification due to carbon dioxide can be shown easily by taking a glass of water, adding a suitable pH indicator such as Bromothymol Blue (indicator can also be made using red cabbage – the Internet provides many recipes) and blowing bubbles through it using a straw. The carbon dioxide in the exhaled breath dissolves in the water, forming carbonic acid which causes a colour change. The demonstration shows how increases in atmospheric carbon dioxide dissolve in the oceans causing ocean acidification.

It is important to note that these climate change impacts formed only a short section at the beginning of the show – the show's aim is to present solutions rather than labour the problem. This is an important point for science communicators tackling social problems. With climate change especially, research shows positive as opposed to fear-based messages are most effective to foster social change (O'Neill & Nicholson-Cole, 2009). It is also critical to consider solutions that are practical for the target audience. For example, there is no point promoting recycling as a solution if a community does not have access to such facilities – individuals must be in an environment that allows them control over the behaviour to facilitate change (Ajzen, 1991; Bamberg & Moser, 2007). Just as a commercial entrepreneur considers if a solution will create profit, the social entrepreneur must consider if a solution will solve community problems and create social value.

Research conducted on the show demonstrated it positively influenced both intended behaviour and knowledge of climate change solutions. People's motivation to engage in specific behaviours including composting, recycling, using ethanol-blended petrol and using renewable energy all significantly increased. Putting more effort into helping the environment and talking to friends about actions that can help also increased significantly; however, there was no significant increase in people's willingness to encourage pro-environmental behaviour in others.

Another key feature of the show is that it aimed to present a scientific rationale for why certain behaviours helped with climate change, e.g. recycling allows substantial energy and hence emission savings as opposed to producing new items from raw materials. Underlying knowledge of how different actions lead to different consequences is key to influencing attitudes – a strong determinant of intended behaviour (Ajzen, 1991). People's knowledge of the environmental benefits of ethanol and understanding of why certain actions affect climate change significantly increased. Knowledge regarding the benefits of recycling, renewable energy and the impact of individual actions did not significantly increase; however, scores indicated prior knowledge was already high in these areas. High initial scores restrict both one's capacity to increase them and the potential to measure such increases using quantitative methods, but in sum, the show had positive effects on both knowledge and intended behaviour related to climate change – it was an effective tool to encourage social change.

So What Now: Entrepreneurial Science Communication/ Education in Developing Countries

Developing countries provide many opportunities for social entrepreneurship via science communication. They also, however, provide a raft of unique and nontrivial challenges to overcome. Every country is different with a different set of needs and opportunities, so rather than attempt to provide overgeneralised advice, I will instead briefly share the stories of two inspirational science centre entrepreneurs. The key things these two stories share, in my observation, are that the person had a dream and skills on which to build that dream into a reality, and their principal aim was to bolster their countries and local communities through science communication. Critically, as all social entrepreneurs do, they sought out and seized opportunities.

Dr Jacob Ashong created and now runs the Ghana Planetarium Science Centre. To the best of my knowledge, Ashong's is the only science centre in central, west and east Africa – a huge problem in itself, but one beginning to be addressed by Ashong's entrepreneurial spirit. A visit to the centre's website (www.ghanascienceproject.net) tells an inspirational story embodying many of the entrepreneurial characteristics discussed previously.

Ashong had a dream to build a science centre to address the shortage on his continent; moreover, he had a background teaching university biochemistry. Never losing sight of his dream over several decades, Ashong built relationships that eventually resulted in donations of equipment, expertise and funds. I was fortunate enough to meet Ashong in 2011, and I am sure his friendly demeanour and passion for astronomy and science education have been a huge part of the project's success. I would encourage readers looking for inspiration and strategies for their own entrepreneurial activities to visit the centre's website for its beginnings and its Facebook page (Ghana Planetarium) to see the stellar work it conducts on a frequent, ongoing basis.

The second story I will share is the University of Zululand Science Centre in KwaZulu-Natal, South Africa. From humble beginnings in a disused classroom in 1986, the centre has now grown into new premises including three exhibition halls, an auditorium, computer-based learning lab, workshop and classroom spaces. In 2011, the centre made history opening Africa's first children's museum where they provide early childhood development programmes for children aged 3–7 as well as running training workshops for crèche facilitators. You can read about the history of the centre – which is both inspiring and illustrative for those looking to emulate such successes – at www.unizulsc.com.

The centre Director since 1992, Derek Fish, is a fine example of a social entrepreneur with commercial nous. He has gathered support from the government, banks, mining companies, overseas philanthropists, medical trusts, universities and many others – anywhere he saw an opportunity to match a source of goods, know-how or funding with the needs of his visitors, including the HIV AIDS work described earlier in this chapter. Opportunities come in many forms, with staff

exchanges, overseas volunteers and donated exhibits from international science centres complementing financial support from local and global industries. Fish has developed enduring relationships with his supporters that are based on solid results, leading him to the mantra 'People fund successes, not distresses'. Fortunately for the students of KwaZulu-Natal, where schools are seriously under-resourced, Fish was able to combine his entrepreneurial mind-set with training as a secondary school science teacher to create a sustainable, innovative science centre.

Critically, Fish's operation started small and grew iteratively in response to both needs and opportunities. Many entrepreneurs looking to contribute to their communities through science communication, especially in developing countries, may be stifled by where to start. From the successes I have seen, the best advice is to just start. Start small, build networks and relationships, always be alert to every opportunity, and seize the best of them. A social entrepreneur's enterprise tends to snowball, with one opportunity leading to several others. So find your first opportunity (or perhaps it will be the second, third or tenth; don't give up) and hang on for the ride – I hope it is as rewarding for you as it is for the people who benefit from the science you share.

Summary and Conclusion

This chapter has outlined opportunities for science communicators to engage in commercial and social entrepreneurship. From my observations, most science communicators already behave in entrepreneurial ways; however, they rarely think of themselves as entrepreneurs. While there is potential to make a successful business from science communication and earn an adequate living, one is unlikely to make a fortune and must be cautious to balance the necessity for profit (especially if the sole source of an individual's income) with the obligation for quality science communication. Entrepreneurs viewing science communication as a profit making venture first and foremost are likely to not only be disappointed but also compromise more meaningful rewards. Science communication entrepreneurship is about building a satisfying, worthwhile job which also has the potential to bring about social good – often through providing educational services or inspiring young people about science.

Science communication, however, can also assist with more pressing social issues such as those related to human health and the environment. Although science communication – albeit in many different guises – has long operated in this domain, science shows and, to a lesser extent, science centres are not often considered tools that can drive social change. Evidence presented here suggests that they can make a contribution to difficult problems such as HIV AIDS and climate change. The research presented here did not, however, look at whether intended behaviour translated into actual behaviour or if the behaviour change was long term. More research and programmes targeted at behaviour change on which to research are required to establish this. To further this aim, science communication theory can

draw much from behavioural psychology and related fields to underpin social entrepreneurship ventures. Science communication practice can also draw from within itself, especially as a source of inspiration and know-how to others, such as the two case studies described in the previous section.

In sum, science communication contributes greatly to creating social value, but there is the potential to do more – in particular amongst science centre and science show practitioners. Communities across the globe are affected by problems where science can provide useful perspectives and solutions; one role of an entrepreneurial science communicator is to identify these problems and turn them into opportunities for positive change through effective communication.

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