

Science & Theatre

This page intentionally left blank

Science & Theatre: Communicating Science and Technology with Performing Arts

BY

EMMA WEITKAMP

University of the West of England, UK

AND

CARLA ALMEIDA

Oswaldo Cruz Foundation (Fiocruz), Brazil



United Kingdom – North America – Japan – India – Malaysia – China

Contents

List of Figures	<i>ix</i>
List of Tables	<i>xi</i>
About the Authors	<i>xiii</i>
Acknowledgements	<i>xvii</i>

Prologue

1 Introduction	3
1.1 The Rise and Rise of Science-Theatre	4
1.2 Brief History of Science Communication and Its Paradigms	6
1.3 Structure and Organisation of this Book	9

Act I

2 Conceptualising Science-Theatre	15
2.1 Terms, Definitions and Categories	16
2.2 A Plethora of Concepts, a Lack of Focus	19
2.3 A Science Communication Lens	21
2.4 Science-Theatre that Creates Dialogue	24
3 Mapping Science-Theatre Practices	27
3.1 Survey Design	27
3.2 Profile of Respondents	28
3.3 Institutions Involved with Science-Theatre	31
3.4 The (Central) Issue of Funding	32

4	Creating Science-Theatre: Who Participates and Why	35
4.1	Who Collaborates?	35
4.2	Reasons to Participate in Art-Science Projects	37
4.3	From Education to Spectacle: Pragmatic, Personal and Fundamental Drivers	39
4.4	Survey Respondents' Motivations	41
4.5	Conceptualising the Motivations Behind Science-Theatre	47
4.6	Creating Effective Collaborations	49
5	Topics and Venues: Beyond Expectations	55
5.1	Topics and Content: What Science Hits the Stage?	55
5.2	A Survey of Contemporary Science-Theatre Topics	57
5.3	Traditional Venues for Science to Meet Theatre	62
5.4	Every Place Can Host Science-Theatre	65
6	Formats: Unbounded Creativity, Experimentation and Interaction	69
6.1	Science-Theatre Traditional Formats	70
6.2	Adopting, Adapting and Creating New Formats	73
6.3	Emerging Participatory Formats	75
6.4	Opportunities for Participation and Science Communication Goals	78
6.5	Interactions in Practice and Beyond Performance	80
7	Spectators, Participants and Co-Creators	85
7.1	Conceptualising Audiences	86
7.2	Who Attends Science-Theatre?	88
7.3	Audience Outcomes	91
7.4	Measuring Audience Responses	95

Act II

8	Actors with Agency: Immersive Science Theatre and Science Identity	103
8.1	Overview of Science Theatre in UK Context	104
8.2	Science Theatre: The SMASH-UK and SMASHfestUK Programme	105
8.3	Space Plague	109
8.4	Reflections, Lessons and Challenges	110

9 Theatre Within a Research Institute: Addressing Shared Goals	113
9.1 A Consistent Experience of Professional Science-Theatre	114
9.2 Institutional Bonds That Go Beyond Science Expertise	116
9.3 Approaching an Audience with Little Connection to Science or Theatre	118
10 PAST's Walking Tall Science Theatre Project	121
10.1 Overview of Science Theatre in South Africa	122
10.2 Sharing the Social Value of Prehistory Through Walking Tall	124
10.3 Walking Tall's Impact	125
10.4 Challenges Encountered	130
10.5 Lessons Learned	132
11 The Voices and Bodies of Science: Theatre with Researchers	135
11.1 Marionet's Work with Researchers	136
11.2 Asking Questions and Creating from Scratch	138
11.3 Science Though Researcher's Own Words	140
12 Augmented Lectures: A Unique Resource to Inspire, Outreach and Understand Science	143
12.1 An Art-Science Discourse	144
12.2 Creating Augmented Lectures	145
12.3 Factors Affecting the Outcome	146
13 Scenes of Aquatic Life: Theatre, Dance, Music and Science	151
13.1 Theatre as a Knowledge Bridge	151
13.2 Collaboration to Transform	154
14 Instytut B61: Translating the Invisible into Immersive Artsci Theatre	157
14.1 The Artsci Model In Practice	159
14.2 Science in Motion	161
15 From Math Class to the Theatre: A 15-Year Chronicle of STEAM	169

Epilogue

16 Conclusion	<i>181</i>
16.1 Main Findings and New Frameworks	<i>182</i>
16.2 Challenges to Overcome	<i>186</i>
16.3 Future Directions	<i>187</i>
Appendix 1: Survey Questionnaire	<i>191</i>
Appendix 2: Example Research Protocol	<i>197</i>
References	<i>201</i>
Index	<i>213</i>

List of Figures

Fig. 3.1.	Global Distribution of Survey Respondents.	29
Fig. 3.2.	Profile of the Survey Respondents Regarding Years of Experience (A), Workplace (B) and Employment Status (C).	31
Fig. 3.3.	Role of Science-Theatre Within Participants' Institutions and Organisations.	32
Fig. 3.4.	Funding Sources for Respondents' Initiatives in Science-Theatre.	34
Fig. 4.1.	Respondents' Collaborators in Science-Theatre Projects.	37
Fig. 4.2.	Ranking of Respondents' Priorities Regarding Their Main Science-Theatre Productions.	47
Fig. 5.1.	Areas of Science Explored in Respondent's Science-Theatre Productions.	58
Fig. 5.2.	Venues Where Respondents Have Presented Science-Theatre.	65
Fig. 6.1.	Formats of Science-Theatre Used by Respondents.	74
Fig. 6.2.	Forms of Audience Interaction Used in the Respondent's Science-Theatre Projects.	81
Fig. 8.1.	SCENE Model Incorporating the Co-design Process.	107
Fig. 9.1.	A Scene from <i>Cidadela</i> (2019), a Play About Structural Sexism with a Cast Entirely Composed of Black Women, Aligning with Institutional Policies for Gender and Race Equity.	117
Fig. 10.1.	Walking Tall Performs in Rural and City Schools Where Facilities May Vary Greatly.	122
Fig. 10.2.	Actors Use Physical Theatre and Minimal Props for Walking Tall Performances.	125
Fig. 11.1.	A Scene from <i>As Moscas são Ratos que Voam</i> .	138
Fig. 12.1.	A Moment from the AL <i>Lucienne, Perreca and the Gravitational Waves</i> , Which Premiered Live at the Teatro Della Meraviglia Festival in Trento, Italy, on 19 June 2021.	144
Fig. 13.1.	A Scene from <i>Escenas de la Vida Acuática</i> .	152
Fig. 14.1.	Map of the <i>Cosmic Underground Journey</i> Highlighting Performance Sites.	162
Fig. 14.2.	The 'Stage' Extended Beyond the Freight Waggons into the Entire Space of Railway Stations.	163

x *List of Figures*

Fig. 14.3.	The Metaphor 'Time Is Water' Was the Main Structural Metaphor of the Narrative of <i>Cosmic Underground</i> .	164
Fig. 14.4.	<i>So Far, So Good</i> Performed During <i>Cosmic Underground</i> by SOFA and Dominik Smużny Explored the Influence of Euphoric States on the Perception of the Passage of Time.	167
Fig. 15.1.	A Scene from <i>Curie Me Away</i> .	173

List of Tables

Table 4.1. Respondents' Reasons to Work with Theatre in the Context of Science Communication.	42
Table 5.1. Science-Theatre Productions Divided by Broad Topics.	60

This page intentionally left blank

About the Authors

Pablo Aguilar is a Brazilian actor, clown and educator, with a degree in Performing Arts from the Federal University of the State of Rio de Janeiro, Brazil. He has worked with comedy and clowning since 2006 and is a founding member of Bando de Palhaços, a group that researches languages involving humour, clowning, comedy and musicality. In 2011, he joined *Ciência em Cena*, an area of the Museu da Vida/Fiocruz (www.museudavida.fiocruz.br) dedicated to art-science projects, where he is responsible for the production, direction and performance of the museum's plays.

Carla Almeida is a Science Communicator and Researcher at the Museu da Vida, Science Museum of the Oswaldo Cruz Foundation (Fiocruz), in Brazil, where she works in the areas of public engagement with science; science, media and society; and science and theatre. She teaches on Fiocruz's Diploma Course in Communication and Popularisation of Science and Masters in Communication of Science, Technology and Health. She is author of articles on science communication and science and theatre and co-author of the books *Cordel e Ciência: a ciência em versos populares* and *Ciência em Cena: Teatro no Museu da Vida*.

Héilton Barros has a degree in Biological Sciences and a Masters in Science from Oswaldo Cruz Institute, Brazil. Formerly, as Manager of Science and Technology (S&T) at the Minas Gerais State Health Department, he coordinated the Research Program for the SUS (Unified Health System) of the Ministry of Health. He has experience in Science Communication, working mainly on non-formal education, management in science museums and development of scientific exhibitions. He coordinated the Visit and Public Service of the Museu da Vida/Fiocruz between 2017 and 2018 and its Education Service between 2018 and July 2021, when he took over as Head of the museum.

Robert J. Blumenshine is the Chief Scientist of the Palaeontological Scientific Trust, an Emeritus Professor at Rutgers University, USA and an Honorary Professor at the University of the Witwatersrand, South Africa. He holds a PhD in Anthropology from the University of California, Berkeley. He has published extensively on the behaviour and ecology of human ancestors, and has conducted archaeological, palaeontological and wildlife research in Africa, principally in Tanzania as Co-leader of a human origins research project at Olduvai Gorge, Tanzania, since 1987.

Sadie Bowman (she/her) is a Theatre Artist, Songwriter and Co-founder of Matheatre, USA. She has presented at the Association of Science and Technology Centers conference, Theatre About Science: Theory and Practice conference, and performed for science education institutions worldwide, including Science Centre Singapore, National Taiwan Science Education Center and National Atomic Testing Museum (part of the Smithsonian Institution). Prior to collaborating with Matheatre colleagues Ricky Coates and Marc Gutman, she was a producer of comedy variety shows, a touring comedy musician and a musical theatre accompanist. She holds a BA degree in Theatre Arts from the University of Minnesota-Twin Cities.

Andrea Brunello has a PhD in Physics. Actor and playwright, he is the Director of Arditodesio Company and Jet Propulsion Theatre, a laboratory for theatrical creation connected to science, the people of science and the scientific tale, in coordination with the Laboratory of Communication of Physical Science at the University of Trento, Italy. He has written and performed plays all over Europe as well as Africa and the United States. His work centres on the idea that science shapes the way we look at the world and it can therefore become prime material for engaging storytelling and gripping dramaturgy.

Wyn Griffiths lectures in Product Design and Engineering, and his research involves inclusive design, Design for Planet, collaborative creativity, manifestations of the 'Civic University', immersion and narrative transportation. He co-founded the award-winning festival SMASHfestUK. His work spans many sectors and a disparate range of design, engineering and public engagement arenas, including event, installation, experience and exhibition design, build and management.

Lindsay Keith is a BAFTA-nominated Film-maker, Festival Producer, Writer and Research Fellow. Following a PhD at the Imperial College London, UK, she worked in broadcast television, founding The Revery in 2011, and the award-winning immersive science and arts festival SMASHfestUK in 2014. She works as a Research Fellow at the University of Greenwich, UK, where her specialism is embodiment and behaviour change through immersive narratives.

Andrea Leenen has been employed by PAST, the Palaeontological Scientific Trust, South Africa, since 2000 in various management positions, currently as CEO. She holds an Honours degree (with distinction) in Archaeology and Anthropology and an MSc degree (with distinction) in Palaeontology from the University of the Witwatersrand. Her interests allow her to combine her passions for grassroots science education, nature conservation, the performing arts, the public understanding and communication of the palaeosciences and the advancement of African leadership in the field. Through PAST, she uses the science of our African origins to advocate anti-discrimination, conservation, a love of Africa and the betterment of our planet. Sadly, Andrea Leenen passed away in early 2022.

Mário Montenegro is a Theatre Director, Actor, Playwright, Professor of Performance and Theatre Studies at the University of Coimbra, Portugal, and Senior Researcher at the Centre for Interdisciplinary Studies. He is the Artistic Director of Marionet (www.marioneteatro.com), a theatre company focused on the interplay between theatre and science, where he has directed more than 40 plays. His research interests relate to the interactions between the performing arts and science, including science dramaturgies, worldwide production of plays related to science, research-based theatre, theatre with researchers and the performing arts in science communication.

Stefano Oss is a Professor of Physics at the Physics Department of University of Trento, Italy. He worked as an experimentalist in the field of low-energy atomic physics and as a theoretician in the area of dynamical algebraic symmetries applied to molecular spectroscopy and is author/co-author of about 130 scientific papers. He decided to contribute to the development and functioning of a Laboratory of Communication of Physical Science to support the physics education research area. He believes that scientists and science need specialists and new ideas in the communication arena to bring this enterprise to its highest level.

Javier Garcia de Souza is a biologist, actor and dancer with a PhD in Natural Sciences and a Diploma in Public Communication of Sciences. He is a Researcher of the National Scientific and Technical Research Council, Argentina, working in limnology and ecological aquaculture of native fish. He is also a Teaching Assistant at the National University of La Plata and Science Communicator on radio, TV social media and especially through scenic arts. He is a member of #Exploracuat@s, a project focused on environmental education through games, of Popper Stand Up, a group of scientist-comedians that communicate sciences with humour, of the dance company Espiardanza and of GECE [science and scene studies group]. He is Author, Choreographer and Director of *Escenas de la Vida Acuática*, which combines science, theatre, dance and music.

Erik Stengler teaches at the Cooperstown Graduate Program, SUNY Oneonta, USA, situating science museums, science centres and planetariums in the wider context of science communication. As an Astronomer, he worked using data from space-based observatories: the International Ultraviolet Explorer and the Hubble Space Telescope. After moving into the field of science communication, he developed a practice-based research interest in science museums and in science in popular culture, specially in TV and film. In both areas, he has published articles, book chapters and edited conference proceedings volumes, often in close collaboration with students whom he likes to encourage to present at conferences and meetings.

Jan Świerkowski is a curator, futurologist, artist and astronomer and holds an MA in Astrophysics from the Faculty of Physics, Astronomy and Applied Computer Science, Nicolaus Copernicus University, Poland. He is currently a

Researcher at the Research Centre for Communication and Culture in Lisbon. He is an Honorary Ambassador of Nicolaus Copernicus University in Toruń, winner of the Ministry of Science and National Heritage Science Populariser of the Year Award in Poland 2017 and holder of a patent US11024191B2 for a System for a multimodal educational display in a pop-up science centre. In 2012, he curated *Cosmic Underground*, an arts/sci immersive performance held in a freight train travelling from Tallinn to Lisbon, and funded by the European Commission.

Emma Weitkamp is a Professor of Science Communication at the University of the West of England, Bristol UK, where she co-directs the Science Communication Unit. Her current research focuses on the actors involved in science communication, especially intermediaries in the process including artists and NGOs; and narrative as an engagement tool (both from the perspective of the communicators and wider publics for narrative forms of engagement). She has produced theatre (most recently, *Chaos Cabaret*) as well as researched audiences for science theatre. She is the author of numerous papers, and co-author of the book *Creative Research Communication* (Manchester University Press).

Acknowledgements

We would like to thank all those who completed our survey of science-theatre in the context of science communication and who shared the survey with their contacts. A special thanks goes to colleagues who participated in the pre-test of the survey questionnaire and helped us to improve it. We would also like to thank the anonymous reviewers of the proposal for this book, who, through their thoughtful suggestions, shaped the book that we offer to you, our readers.