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# Outside the Research Lab

Volume 2: Physics in vintage and modern transport



# Outside the Research Lab

Volume 2: Physics in vintage and modern transport

**Sharon Ann Holgate**

*Science writer and broadcaster, doctor of physics*

Morgan & Claypool Publishers

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*For my mother Joan*



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# Preface

Several of my favourite childhood memories involve aircraft, locomotives, or vehicles. My earliest is of a fast jet from the RAF's Red Arrows display team buzzing the seafront which I was walking along with my Mum. I can recall the lady next to us emitting a terrified scream, while I asked my Mum to lift me up onto a low wall so I could get a better view as the plane made a second pass. I can remember being absolutely transfixed and reaching up towards the jet as if I could touch it. Perhaps not surprisingly, 'fighter pilot' featured on my list of potential career options to explore as a teenager.

Sports cars offered an equal fascination, fuelled no doubt by being taken for a spin in a Lamborghini Countach when I was 8 years old, and being driven round the Goodwood Historic Motor circuit in a beautiful Jaguar E-type which had taken part in Le Mans back in the 1960s.

Likewise steam locomotives were a firm favourite as I was growing up, with many a trip to a preserved railway in school holidays, and hours spent poring over books about locomotives and the UK rail companies in the days of steam. However, my standout memory from that time has to be a footplate ride on one of the most famous steam engines in the world—the A3 Pacific class locomotive *Flying Scotsman*. I can still clearly recall the tremendous heat when the fireman had to open the firebox door to add more coal, and trying desperately to bend my knees so I didn't need to cling onto the handrail and so look like the novice I in fact was.

Perhaps not surprisingly, I still have a fascination for all these types of transport. This led me to come up with the idea for this book which explores some of the physics and technology inherent to preserving and restoring old forms of transport, and creating modern transport for today, and for our future needs. I am hoping that this book—as with the others in my *Outside the Research Lab* series—will provide students and other readers with an interesting insight into some of the diverse applications for physics outside of research laboratories. To help achieve this goal, I have chosen to cover several different aspects of transport, ranging from the restoration of vintage buses to the materials used in the latest supercars. In each case I have interviewed experts working in that field, who have generously given their time to explain how physics and technology impact on their work, and also provided some stunning images.

To keep the book accessible for readers with a wide range of backgrounds, I have only included a small number of equations, and have explained the less familiar scientific terminology and notation. In addition, the more detailed physics is presented in boxes that are interspersed among, but separate from, the main text.

I make no apology for choosing to write about topics that I have a personal interest in—and in some cases have previously written articles about—as I suspect I won't be alone in my enthusiasm for these subjects! I hope they will not only provide

an interesting general read, but also some useful examples of how the physics encountered in taught courses relates to the real world. As someone who has written extensively about careers, I also hope the contents of this book might inspire readers as yet undecided on their future career, or looking for a change in direction, to think about career options that they might not otherwise have considered.

# Acknowledgements

As with the first volume in this series, I could not have written this book without the help of many people. I would first like to thank my editor Nicki Dennis for approaching me to write for the IOP Concise Physics series, and for her help throughout the creation of this volume. Thanks are also due to Brent Beckley, Karen Donnison, Ana San and Mitra Sayadi at Morgan & Claypool, and Chris Benson at Institute of Physics Publishing.

In addition, I'd like to extend my gratitude to all the interviewees who have kindly given their time, expertise and advice, and allowed me to reproduce some fantastic images. I could not have written this book without your enthusiasm and support. I would also like to thank the various experts, press officers, marketing professionals, and enthusiasts who helped me to secure interviews and kindly provided me with additional information and images. These include Mark Allatt from the A1 Steam Locomotive Trust, John Begley from the Elemental Motor Company, Brian Humber and Charlie Ralph at the Spa Valley Railway, Bernhard Lott, Evelyn Necker and Kerstin Schirmer from Siemens, Tony Sparkes, John Stiles, and Ian Tonkin at Continuum Communication. Thanks are also due to Julian Mayers, Ian Rennison and Tracey deWhalley for their help in various ways with this project.

As ever friends and family members have been a tremendous support, in particular Dawson Chance, Larry Crockett, David Culpeck, Rob Scovell, Emma Winder, and my mother Joan.

# About the author

## Sharon Ann Holgate

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© Sharon Ann Holgate. Photo by Stuart Robinson.

Sharon Ann Holgate has a doctorate in experimental physics from the University of Sussex in the UK, where she was a Visiting Fellow in Physics and Astronomy for nine years, and is a Chartered Scientist and Chartered Physicist. She has worked for twenty years as a freelance science writer and broadcaster, with broadcast credits including presenting on the BBC World Service and BBC Radio 4, presenting video podcasts for medical research charity the Myrovlytis Trust and appearing on a ‘Boffins Special’ of the *Weakest Link*. Her articles have appeared in *Science*, *Science Careers*, *New Scientist*, *The Times Higher Education Supplement*,

*E&T*, *Flipside*, *Focus*, *Physics World*, *Interactions*, *Materials World*, *Modern Astronomer*, and *Astronomy Now*, while her first book *The Way Science Works* (a children’s popular science book co-authored with Robin Kerrod) was shortlisted for the Aventis Prizes for Science Books Junior Prize. She was a contributor to the popular science books *30-Second Quantum Theory* and *30-Second Energy*, and her undergraduate textbook *Understanding Solid State Physics* is currently in use as a core text in universities around the world. Her first book for this IOP Concise Physics series was *Outside the Research Lab Volume 1: Physics in the arts, architecture and design*. She has also written careers material, case studies, and press releases for the Institute of Physics and careers material and brochures for The Institute of Physics and Engineering in Medicine, and given talks at venues including the Science Museum in London. Dr Holgate was the Institute of Physics Young Professional Physicist of the Year for 2006, won a Merit Award in the 1994 Daily Telegraph Young Science Writer of the Year competition, and was shortlisted for the radio programme category of the Association of British Science Writers’ Awards in 2005. Outside of work she collects contemporary ceramics, is a regular visitor to art galleries and museums, and enjoys learning about fashion history and steam locomotives. Further information may be seen at [www.sharonannholgate.com](http://www.sharonannholgate.com).