

STEM-PROFESSIONAL WOMEN'S
EXCLUSION IN THE CANADIAN
SPACE INDUSTRY

CRITICAL MANAGEMENT STUDIES

Series Editor: Albert J. Mills

Praise for *STEM-Professional Women's Exclusion in the Canadian Space Industry*

You probably haven't read many books about women scientists working in the space industry, perhaps because there are not many (in both senses). This book, *STEM-Professional Women's Exclusion in the Canadian Space Industry*, from a senior space scientist, formerly the only female mission manager in the Canadian Space Agency, examines in depth and in detail the identities, experiences, careers and career anchors, discourses and contexts of women, and some men, in the sector. By way of expert feminist intersectional poststructuralist analysis, it brings many insights, not just for STEM-professions and professionals, but the wider worlds of men's organizational domination and men's protected and excluding bastions.

Jeff Hearn

(Senior Professor, Gender Studies, Örebro University, Sweden;
Professor Emeritus, Management and Organisation,
Hanken School of Economics, Finland; Professor of Sociology,
University of Huddersfield, UK; author of *Men of the World*)

Women's exclusion has become visible in this highly novel book on the Canadian space industry. STEM-professional women's experiences, their agency and the ways in which they move beyond the positions assigned to them institutionally and professionally are analysed with care through theoretically rigorous debates surrounding identity, power and difference. As readers, we learn about remarkable women in a unique context, and thus teaches us about the ways in which history shapes the present lived experiences of women working in male dominated environments. Excitedly, this book enables us to think what future is possible for women as they continue to break through what would have historically been seen as impossible barriers. A must read.

Alison Pullen

(Professor of Management and Organization Studies,
Macquarie University, Joint Editor-in-Chief,
Gender, Work and Organization)

This book is a beautifully written synthesis of intersectionality and critical sensemaking in one of the most exciting contexts of our time, space. Stefanie Ruel's unique voice and her insightful appropriation of a rich set of ideas to study the core question of her study, "how there were so few STEM-professional women managers in the Canadian space industry," has all the ingredients of a classic in the empirical study of identity and intersectionality. Her research marks a thorough understanding of the complex

relationships between context, knowledge and experience that is required to perform a detailed analysis of discourses and power-relations in such a way to reveal the exclusionary order prevailing in the space industry. Through the brilliant fusion of diverse theoretical and empirical ingredients, she has provided us a thought-provoking book that is a true adventure for the reader.

Päivi Eriksson

(Professor, University of Eastern Finland Business School)

Dr Stefanie Ruel is the only woman to fulfil the role of Life Sciences Mission Manager in the billion-dollar Canadian space industry, a sector which is dominated by White cismen. In this beautifully written and highly engaging book, Dr Ruel explores micro-level, everyday interactions in the industry to surface the discourses which make for the ongoing exclusion of women from scientific, technical, engineering and mathematical management positions. Her data is drawn from detailed interviews with men and women in the space industry and analysis of publicly available documents. The book provides a compelling lens on an industry which is under-researched in organization studies and a much-needed corrective to research which focuses only on ‘who’ and ‘how many’ questions about gendered, raced and classed exclusion and discrimination. It also makes a powerful case around the resistances that female STEM professionals can mount in the space industry as well as how their male colleagues can support them in enacting social change. Put simply, it is a must read for anyone interested in difference, identity, discrimination and exclusion, in organizations and elsewhere.

Jo Brewis

(Professor, Department of People and Organizations,
The Open University Business School)

It is impossible to read this book without being impelled to action in the academic and in the social fronts. The work is an extraordinary act of organizational scholarship, achieving theoretical and empirical richness via comingling of organizational and feminist theorizing, Foucault, and the voices of human protagonists in the context of the Canadian space industry. As importantly, doing this research guided the author toward courageous acts and realizations; a poignant personal story where the significance of academic achievement gives way to new spaces for action and commitments to social change. A “must read” if there was one in recent organization studies!

Marta Calás

(Professor, Isenberg School of Management,
University of Massachusetts, USA)

CRITICAL MANAGEMENT STUDIES

STEM-PROFESSIONAL WOMEN'S EXCLUSION IN THE CANADIAN SPACE INDUSTRY

Anchor Points and Intersectionality at
The Margins of Space

BY

STEFANIE RUEL

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India – Malaysia – China

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INVESTOR IN PEOPLE

*For my children and my husband – May you each rise above the attributed
anchor points you will encounter on a day-to-day basis.*

Contents

List of Figures	<i>xi</i>
List of Tables	<i>xiii</i>
Abbreviations	<i>xv</i>
About the Author	<i>xvii</i>
Preface	<i>xix</i>
Acknowledgments	<i>xxi</i>
Prologue	<i>1</i>
Chapter 1 The View from Earth	<i>3</i>
Chapter 2 Forms of Context	<i>27</i>
Chapter 3 Forms of Knowledge	<i>51</i>
Chapter 4 Forms of Experiences	<i>91</i>
Chapter 5 Research Methodology	<i>113</i>
Chapter 6 STEM-professional Women’s Range of Anchor Points	<i>131</i>
Chapter 7 Canadian Space Industry’s Forms of Context, and STEM-professional Women’s Dominant Ideas and Practices	<i>159</i>
Chapter 8 Relationship between STEM-professional Women’s Anchor Points and Forms of Context, and Forms of Experiences	<i>201</i>

Chapter 9 Revealing the ‘How’ of an Exclusionary Order and Social Justice Initiatives	233
Final Word: My Journey	263
Index	265

List of Figures

Chapter 1

Figure 1.1	Research Framework.	9
Figure 1.2	My Possible Range of Anchor Points.	16

Chapter 2

Figure 2.1	Global Space Industry Stakeholders.	28
Figure 2.2	Canadian Space Industry Stakeholder Map.	32

Chapter 3

Figure 3.1	Range of Anchor Points for an Individual.	79
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Chapter 6

Figure 6.1	Geirit's Map of Identities.	134
Figure 6.2	Eliya's Map of Identities..	136
Figure 6.3	Arwyn's Map of Identities.	140
Figure 6.4	Desrit's Map of Identities.	143
Figure 6.5	Vigrine's Map of Identities.	146
Figure 6.6	Inenya's Map of Identities.	151

Chapter 7

Figure 7.1	Geirit's Cell of Influences.	162
Figure 7.2	Arwyn's Cell of Influence.	172
Figure 7.3	Desrit's Cell of Influence..	178
Figure 7.4	Vigrine's Cell of Influence.	182

List of Tables

Chapter 3

Table 3.1 Core Concepts of Intersectionality. 65

Chapter 5

Table 5.1. Participants and Some of Their Intersecting Identities. 116

Chapter 6

Table 6.1 Summary of Range of Anchor Points. 155

Chapter 7

Table 7.1 Summary of Found Meta-rules, Rules, Formative Contexts,
and Dominant Ideas. 194

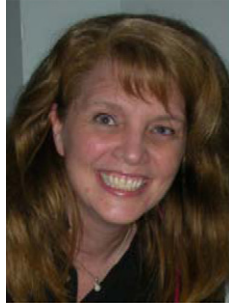
Chapter 8

Table 8.1 Summary of Forms of Knowledge, Forms of Context, and
Forms of Experience. 225

List of Abbreviations

AI	Artificial Intelligence
CNES	<i>Centre national d'études spatiales</i>
CSA	Canadian Space Agency
CSM	Critical Sensemaking
CV	Curriculum Vitae
DLR	<i>Deutsches Zentrum für Luft- und Raumfahrt</i>
DND	Department of National Defence
DRB	Defence Research Board
DRDC	Defence Research and Development Canada
DRTE	Defence Research Telecommunications Establishment
EE	Employment Equity
ENG	Engineer (occupational designation)
ESA	European Space Agency
EX	Executive
G7	Group of 7
G20	Group of 20
GMRD	Guided Missile Range Division
ISS	International Space Station
JAXA	Japan Aerospace Exploration Agency
JPL	Jet Propulsion Laboratory
MDA	MacDonald Dettwiler and Associates
NASA	National Aeronautics and Space Administration
NRC	National Research Council
OECD	Organization for Economic Co-operation and Development
PC	Physical Scientist (occupational designation)
SSHRC	Social Sciences and Humanities Research Council
STEM	Science, Technology, Engineering, Mathematics
UKSA	United Kingdom Space Agency
USA	United States of America
USSR	Union of Soviet Socialist Republics
WFA	Work Force Availability

About the Author



Stefanie Ruel – mother to four children, early career academic, former life scientist – received her Bachelor of Science (Major Mathematics) from McGill University. She also holds a Masters of Business Administration, from Athabasca University, Alberta, Canada. In late 2017, she successfully defended her dissertation and was awarded the degree of Doctor of Business Administration from Athabasca University. She also received Athabasca University’s Convocation Scholarship for Academic Excellence, graduating top of her graduating cohort. She was awarded the Academy of Management Critical Management Studies Division’s 2018 Best Dissertation Award for her work entitled “Multiplicity of ‘I’s’: Women’s exclusion from STEM-management in the Canadian space industry.” She also won the Best Student Paper Award, at the Administrative Sciences Association of Canada (ASAC) 2017 conference, for her paper entitled “The ‘silent killers’ of a STEM-professional woman’s career: A critical sensemaking study of discourses within the Canadian Space Industry.”

Dr Ruel was, until recently, a Senior Mission Manager in Life Sciences at the Canadian Space Agency (CSA), leading more than ten life sciences missions into space. She was also the Increment Payload Manager for Canadian Commander Chris Hadfield’s return to space, aboard the International Space Station, in 2013. Dr Ruel is currently an assistant professor at Concordia University, John Molson School of Business, Faculty of Management. Her research agenda includes a critical examination of gender and diversity in science, technology, engineering, and mathematics (STEM) contexts, framed within intersectionality scholarship. She focuses on both historical and contemporary concerns in these STEM contexts, putting forth social justice initiatives to move individuals and society away from systemic discriminatory practices.

Dr Ruel is the sole author of a number of academic papers including: “The ‘silent killers’ of a STEM-professional woman’s career” in *Equality, Diversity and Inclusion: An International Journal*, and the forthcoming “An open letter to the Universe: A poststructural reflection on conducting ‘good’ research” in the *Qualitative Research in Organizations and Management Journal*. She has also collaborated on published academic papers including “Intersectionality at work: The case of Ruth Bates Harris and NASA,” coauthored with Dr Albert J. Mills and Dr Janice L. Thomas, in the journal *Ephemera*.

Preface

One of the great pleasures of editing the Emerald Critical Management Studies book series is that I get early exposure to amazing work. Nowhere is this more evident than in the current book by Stefanie Ruel. How often do we get a peek, let alone an in-depth insight, into a major space agency – the Canadian Space Agency (CSA) – and space industry? On the surface, we are drawn to the glamour of the space industry, but Stefanie is quick to puncture that illusion. She does so by sharing her own attraction to the industry when, as a girl, she was seduced by the glamour and excitement of space as she watched the first of the Star Wars movies back in 1977 – alluding to the fact that it held out the promise of being the “coolest job ever.” Yet, as she was later to discover, many of the challenges of space did not lay with the “Dark Side of the Force” but closer to earth – much closer to earth than she could have imagined. As she rose through the ranks to become the CSA’s only woman Mission Manager, she encountered a number of discriminatory practices and attitudes that negatively affected those that didn’t fit the masculine stereotype of “the right stuff.” The label of the CSA’s *only* woman Mission Manager speaks not only to her accomplishments but also to the discriminations that prevented other women from achieving the same level or professional standing within the space industry. In keeping with the Star Wars simile, Doctor Stefanie Ruel – to give her, her full academic title and one of her many anchor points – takes us through a journey of challenge and change as she encourages the reader “to consider what can be done to change the systemic exclusionary social reality of this industry.” In her own words, she advises us to “hang on, [because] you too have embarked on a Star Destroyer!”

There is an old feminist saying that “the personal is political” and Professor Ruel takes this to heart, placing herself at the center of narratives but only to illuminate the situation that many women have expressed to her as she searched for answers to address discrimination in the Canadian space industry. As she explains her own process of “doing space,” there is an important balance in the study between her own insights and those of the women she worked with, interviewed and otherwise talked to. As she puts it, the book is not about her but she is present in it. It is about who she is, who she is becoming and her varied emotions, which are imbedded at all levels of the text. She refers to this process as navigating “between objective and subjective discourses;” between the scientist that had once occupied a central part of her identity to the feminist poststructuralist researcher engaged in a study of the very discourses that were associating herself and other women with a sense of “Otherness” and marginalization.

As we begin to take this ride on the Star Destroyer, Dr Ruel cautions us that we are about to encounter a very complex situation, involving the use of various lenses to help make sense of what we are seeing. But, she assures us, we will

understand the complexity through an oscillating process involving breaking it down into its composite parts and then reassembling it back to the larger picture of “what it is to ‘do space’ as a STEM-professional woman.” This, incidentally, is no mean feat. Researchers and practitioners alike are often awed by the complexity of any issue and resolve. The answer, especially with regard to research, is often to abandon complexity and focus on selected aspects of a given situation. Dr Ruel has chosen to take on the sheer sweep of complexity to allow us to understand and feel the different elements of a situation. To do this, along the way, we will encounter *anchor points* (experiential traces of identity/labels established through interactions with/and reflections on other people); *social psychological processes* (cognitive sensemaking); *formative contexts* (dominant practices and ideas that influence sensemaking); *micro-, meso-, and macrocontextual levels* (organizational rules and values); *discourses* (powerful ideas and interrelated practices that construct privileged, marginalized, and neglected identities); *intersectionality* (varying relational points of identity that influence sense of self); and several key theories, including identity theory, poststructuralism, intersectional feminism, and critical sensemaking – all deftly handled through Ruel’s careful analysis and structuring.

Albert Mills
Series Editor

Acknowledgments

Whenever I think about space, I can't help but think about dimensions. The first three dimensions are, for the most part, known and accepted: moving up and down in space; moving front to back, or back to front; and, finally, moving across, left to right, or right to left. The final dimension, time, is for me the most fun to consider. It is, simply stated, the translation of an object through space over time. As we all move through space-time, we bump into each other, interacting and influencing each other. This is my opportunity to reflect on my journey through this fourth dimension, and how the interactions and influences of the past will continue to influence and interact with my future. I am embracing the earliest point that I remember, in my experience of space-time, with respect to my journey toward awareness, in such a way to reach out through the dimensions to acknowledge individuals who influenced and interacted with me.

I would first like to thank George Lucas and Carrie Fisher. Mr Lucas had the courage to share his vision of what space travel would be like, influencing a little girl in 1977 to believe that she could reach for the stars. Ms Fisher, the embodiment of the rebel Princess, led others into space in spite of her (cis)gender and her small stature. She will always be a Princess to me, one who can break out of any tight situation, including a trash compactor, in order to save the Universe.

To my MBA supervisor, Dr Mark Julien, Brock University, to whom I continue to be so very grateful for his support, guidance, and ongoing confidence in me. Without his gentle push, I never would have found the courage to reveal the systemic discriminatory social reality that I was a part of for so long.

A big thank you to my doctoral co-supervisors, Dr Janice Thomas, Athabasca University, and Dr Albert Mills, Saint Mary's University, who believed in me throughout my awkward first steps in writing this book. Their confidence in me never faltered, in spite of my producing such terrible first draft(s) that I cringe, even today, to even think about them. I believe, Dr Thomas, that I finally have a healthy relationship with commas. Dr Mills, two shy individuals, found each other at the International Doctoral Consortium in 2013. I can state, without hesitation, that my life changed tremendously since that first encounter with you. My state of being is free to embrace "who I becoming," thanks to you.

I would be remiss if I did not acknowledge also the support and guidance I received from my external committee member, Dr Gabrielle Durepos, Mount Saint Vincent University. Her excitement for my suggested research in the space industry, and her patient and detailed reading of the initial drafts of this work, were generous gifts that are reflected in this book. I must also acknowledge Dr Jeff Hearn, Örebro University, Sweden/Hanken School of Economics, Finland, and Dr Maddy Janssens, KU Leuven, external examiners for my proposal and dissertation defense, respectively. Dr Janssens kind and positive words of encouragement at the beginning of my defense will stay with me always. The

discourse she chose to lead with set such a positive tone for my defense, that it helped me to believe that I could do this!

A special thank you to my Athabasca University cohort, and to the academic and administrative staff that contributed to my ongoing learning and development. I must also single out Drs Kay Devine, Deborah Hurst and Kai Lamertz, and Mrs Jill Grandy, for helping me in so many ways during my time at Athabasca. I would also like to thank the Graduate Student Research Fund, and the Doctoral Level Student Bursaries for their financial support.

I was, and continue to be, extremely fortunate to have a wonderful group of friends and academic scholars at Saint Mary's University, Sobey School of Business. Thank you so much for your support, your encouragement, and your belief in me! I look forward to continuing to walk forward with you, as we develop our respective areas of scholarship. I also want to reach out to thank the many new academic friends that I have made throughout the world. Your excitement for my research, and for me as a person, filled me with promise for my future as an academic. I must also thank my former Canadian Space Agency friends. I wish to also thank all the study participants, who worked across the Canadian space industry, for their time, honesty, and trust in me to carry their stories and narratives forward. You each showed such courage and such a willingness to talk about your respective experiences in this industry. Without this openness and trust, this book would not have been possible.

Finally, I would like to thank my family for their love, patience, and support. To my father, the first Dr Ruel, who in spite of his military/engineering training, was able to see that his eldest daughter had to go to university to earn a STEM-professional designation. I am eternally grateful to my husband, Greg, for his willingness to take on more family responsibilities while I disappeared into my virtual world of learning and writing. To my children, I cherish the times you came and sat with me at the dining room table to do your homework with me while I conducted my research. You each believed in me, and in my skills and abilities, even when you didn't understand what I was writing about. You made this whole adventure possible.

May the Force be with you all, always.