



Big Science, Innovation & Societal Contributions

Shantha Liyanage, Markus Nordberg
and Marilena Streit-Bianchi (editors)

What is this book about?

- Discuss Big Science processes and give insights from Particle Physics and Astrophysics experiments and how they relate to social advancement.
- Explain underlying conditions leads to Big Science and its role in solving World's most complex scientific mysteries.
- Contribute to our understanding of underlying Big Science processes and explore methods of how scientific knowledge integrate with common understanding
- Examine interconnection among knowledge, innovation and social theories.

Structure of the Book

- PART 1 BIG SCIENCE OPPORTUNITIES AND CHALLENGES (5 Chapters)
-Knowledge Creating processes - LHC, ATLAS, CMS, CERN
Experiments, FCC and beyond
- PART 2 INNOVATION THAT WORKS (4 Chapters)
-Knowledge assimilation and value adding activities and contribution
of Astrophysics.
- PART III ORGANISATIONAL AND SOCIETAL IMPLICATIONS
-How knowledge contribute and integrated with society(6 Chapters)

Part 1- BIG SCIENCE OPPORTUNITIES AND CHALLENGES

1. Big Science and Society as Seen through Research Lenses

Markus Nordberg, Shantha Liyanage, and Marilena Streit-Bianchi

2. Chasing Success: The ATLAS and CMS Collaboration

Peter Jenni, Tejinder S. Virdee, Ludovico Pontecorvo, and Shantha Liyanage

3. A Machine with Endless Frontiers: The Large Hadron Collider (LHC)

Lyn Evans, Frédérick Bordry, and Shantha Liyanage

4. Innovating Accelerator Technologies for Society

Amalia Ballarino, Tim Boyle, and Shantha Liyanage

5. Leapfrogging into the Future

Michael Benedikt, John Ellis, Panagiotis Charitos, and Shantha Liyanage

Part 2 - INNOVATION THAT WORKS

6. Knowledge Diffusion by Design: Transforming Big Science Applications

Christine Thong, Anita Kocsis, Agustí Canals, and Shantha Liyanage

7. Big Science, Leadership and Collaboration

Grace McCarthy, David Manset, Marilena Streit-Bianchi, Viktorija Skvarciany, and Shantha Liyanage

8. The Evolution of Astrophysics towards Big Science: Insights from the Innovation Landscape *David Reitze,*

Alan R. Duffy, James Gilbert, Mark Casali, Elisabetta Barberio, and Shantha Liyanage

9. Big Science Medical Applications from Accelerator Physics: Impact on Society

Mitra Safavi-Naeini, Timothy P. Boyle, Suzie Sheehy, and Shantha Liyanage

Part 3- ORGANISATIONAL AND SOCIETAL IMPLICATIONS

10. Big Science as a Complex Human Enterprise

Beatrice Bressan, Anita Kocsis, Pablo Garcia Tello, and Shantha Liyanage

11. Big Science and Social Responsibility of the Digital World

Ruediger Wink, Alberto Di Meglio, Marilena Streit-Bianchi, and Shantha Liyanage

12. Well-ordered Big Science, Innovation, and Social Entrepreneurship

Faiz Shah, Beatrice Bressan, Pablo Garcia Tello, Marilena Streit-Bianchi, and Shantha Liyanage

13. Future of Big Science Projects in Particle Physics: Asian Perspectives

Geoffrey Taylor and Shantha Liyanage

14. The Social and Educational Responsibility of Big Science

Steven Goldfarb, Christine Kourkoumelis, Viktorija Skvarciany, Christine Thong, and Shantha Liyanage

15. The Future of Big Science and Social Impacts

Shantha Liyanage, Markus Nordberg, and Marilena Streit-Bianchi

Key Takeaways

- Big Science is here to stay.
- Without Big Science significant break throughs are impossible
- Big Science needs extraordinary efforts from world's leading scientists and work across scientific borders
- Effective collaboration is the key to scientific breakthroughs.
- Special knowledge culture operates in putting together complex experiments and collaborations
- Knowledge progress through serendipity, strategic manoeuvre and careful integration of complex problems and focused scientific efforts