

INSTRUMENTATION BETWEEN SCIENCE, STATE AND INDUSTRY

Edited by

BERNWARD JOERGES

*Wissenschaftszentrum Berlin für Sozialforschung, (WZB) and
Technische Universität Berlin, Germany*

and

TERRY SHINN

*Sociology and History of Science,
CNRS/GEMAS, Paris, France*



KLUWER ACADEMIC PUBLISHERS

DORDRECHT / BOSTON / LONDON

TABLE OF CONTENTS

X Chapter 1	A FRESH LOOK AT INSTRUMENTATION: AN INTRODUCTION	1
	<i>Bernward Joerges and Terry Shinn</i>	
	Research-Technology	2
	Science and Society	4
	Science and Engineering	5
	Theory and Experiment	6
	A Specific Kind of Instrumentation	7
	Interstitial Communities	7
	Generic Devices	9
	Metrology	9
	Dis-Embedding, Re-Embedding	10
	The Book	11

PART I ORIGINS OF THE RESEARCH-TECHNOLOGY COMMUNITY

X Chapter 2	FROM THEODOLITE TO SPECTRAL APPARATUS: JOSEPH VON FRAUNHOFER AND THE INVENTION OF A GERMAN OPTICAL RESEARCH-TECHNOLOGY	17
	<i>Myles W. Jackson</i>	
	Fraunhofer's Metrology of Optical Glass Manufacturing	18
	The Practice of Secrecy: Public and Private Knowledge at Cloister Benediktbeuern	20
	The Invention of a Research-Technological Tradition	22
	Conclusion	26
Chapter 3	THE RESEARCH-TECHNOLOGY MATRIX: GERMAN ORIGINS, 1860–1900	29
	<i>Terry Shinn</i>	
	The Backdrop	31
	The Deutsche Gesellschaft für Mechanik und Optik	33

Prosopography	36
Staatliche Forschung	37
Academia	39
Industry	40
Artisans and Consultancy	41
Engineering	42
Instrument Politics	43
Conclusions: Trajectory and Structure	45

PART II INTERSTITIAL WORLDS

Chapter 4	DISPLACING RADIOACTIVITY	51
	<i>Xavier Roqué</i>	
	The Uses of Accumulation	52
	The Curie Laboratories and the Radium Industry	55
	The Metrology of Radioactivity	58
	The Institut du Radium as a “Generic Institution”	60
	Conclusion	63
Chapter 5	STRANGE COOPERATIONS: THE U.S. RESEARCH- TECHNOLOGY PERSPECTIVE, 1900–1955	69
	<i>Terry Shinn</i>	
	Success and Paradox, 1900–1930	71
	A Narrow-Niche Ground-Swell	72
	A New Focus	74
	The Review of Scientific Instruments	75
	Instrument Citation	77
	Research-Technology versus Narrow-Niche Instruments	79
	Narrow-Niche Initiatives	79
	The Instrument Publishing Company	80
	The Instrument Society of America	82
	Strange Cooperations	84
	Crossing Boundaries	86
	Men out of Academia	87
	Men out of Industry	91
	Exit	93

Chapter 6	MEDIATING BETWEEN PLANT SCIENCE AND PLANT BREEDING: THE ROLE OF RESEARCH-TECHNOLOGY	97
	<i>Patricia Nevers, Raimund Hasse, Rainer Hohlfeld, and Walther Zimmerli</i>	
	The Emergence of Research-Technology in Plant Genetics and Plant Breeding in Germany (1900–1990): A Case Study	98
	Plant Genetics and Plant Breeding in the 1990s	100
	Three Types of Research	101
	Research-Technology in the Form of Plant-Gene Technology and Plant-Cell Biology	103
	Organizational Structures and Processes – Managing Heterogeneous Networks	103
	Research Practice – Developing Generic Devices	105
	Interpretational Framework – Competing Repertoires	109
	Between Theory-Oriented and Product-Oriented Plant Biology	111
	Theory-Oriented Research	111
	Product-Oriented Research	112
	The Role of Research-Technology in Biology and Its Future	115

PART III PURVIEWS OF GENERIC INSTRUMENTS

Chapter 7	IN SEARCH OF SPACE: FOURIER SPECTROSCOPY, 1950-1970	121
	<i>Sean F. Johnston</i>	
	The Technology and Its Proponents	122
	Finding a Common Line: The 1957 Bellevue Conference	127
	New Communities and Their Patrons	128
	Provoking Opposition	129
	Tactics of the Fourier Community	130
	Fate of the Community	138
	Conclusion	139
Chapter 8	PUTTING ISOTOPES TO WORK: LIQUID SCINTILLATION COUNTERS, 1950-1970	143
	<i>Hans-Jörg Rheinberger</i>	
	Radiolabels in Biological and Medical Research	145
	Early Steps in Radiation Measurement	147
	Liquid Scintillation Counting	149

	Testing a Commercial Prototype	152
	Automation: Making the Instrument Work for “Inexperienced Personnel”	158
	Between Industry and Customers	164
	An Interdisciplinary and International Network	166
	Instead of a Conclusion	170
Chapter 9	MAKING MICE AND OTHER DEVICES: THE DYNAMICS OF INSTRUMENTATION IN AMERICAN BIOMEDICAL RESEARCH (1930-1960)	175
	<i>Jean-Paul Gaudillière</i>	
	Patronage and Instruments in the 1930s: The Rockefeller Foundation, Ultracentrifuges and Mice	176
	Making Ultracentrifuges	177
	The Jackson Laboratory and the Origins of Inbred Mice	178
	Scientific Mobilization During the War: Electron Microscopy and Big Biomedicine	180
	Postwar Research-Technology: Mass Production, Instrument-Centered Research and Flexible Uses of Mice	183
	Screening Drugs and Producing Mice	184
	From Quantity to Quality: Making Mouse Mutants at the Jackson Laboratory	186
	Research-Technology, Standard Mice and Flexible Uses	189
	Conclusion	192

PART IV STANDARDIZED LANGUAGES

Chapter 10	FROM DYNAMOMETERS TO SIMULATIONS: TRANSFORMING BRAKE TESTING TECHNOLOGY INTO ANTILOCK BRAKING SYSTEMS	199
	<i>Ann Johnson</i>	
	False Hopes: The Inertia Dynamometer	200
	Skidding and the Research Programs of the Road Research Laboratory	202
	Enter Dunlop Rubber Company	205
	Formation of a Research-Technology Community	208
	Constraints and Problems in Brake Testing	212
	Bridging the Gap from Research-Technology to Antilock Braking Systems	213

Chapter 11	FROM THE LABORATORY TO THE MARKET: THE METROLOGICAL ARENAS OF RESEARCH-TECHNOLOGY	219
	<i>Alexandre Mallard</i>	
	From Atmospheric Chemistry to Urban Pollution Monitoring	221
	DOAS as a Research-Technology	223
	The Calibration of DOAS Instruments: A Metrological Puzzle	225
	Experimental Metrology in Action	227
	Official Metrology and the Practices of Precision	230
	A Market for DOAS Instruments	233
	Research-Technology and the Diversity of Metrological Arenas	236

IN CONCLUSION

X Chapter 12	RESEARCH-TECHNOLOGY IN HISTORICAL PERSPECTIVE: AN ATTEMPT AT RECONSTRUCTION	241
	<i>Bernward Joerges and Terry Shinn</i>	
	The Place of Research-Technology in Social Studies of Science and Technology	241
	Discipline-Related Science and Technology Studies	242
	Transitory Science and Technology Studies	243
	Transverse Science and Technology Studies	244
	Generic Instrumentation, Divisions of Labor and Differentiation	245
	Generic Instrumentation, Re-Embedding and Cohesion	246
	Bibliography of Selected References	249
	List of Contributors	259
	Bibliographical Notes on Contributors	261
	Author Index	265