

Lecture Notes in Physics

Edited by J. Ehlers, München, K. Hepp, Zürich
R. Kippenhahn, München, H. A. Weidenmüller, Heidelberg
and J. Zittartz, Köln

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Imaging Processes and Coherence in Physics

Proceedings, Les Houches 1979

Edited by
M. Schlenker, M. Fink, J. P. Goedgebuer,
C. Malgrange, J. Ch. Viénot and R. H. Wade



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INTRODUCTION

The techniques developed over the last two decades or so have considerably widened the range of particles used as imaging probes. The present volume, concerning imaging with photons (including hard and soft X-rays, visible, infrared and micro-wave regions), electrons, neutrons, ions (protons) and phonons, is a collection of the lectures given during a two week workshop held in Les Houches, France in March 1979 and attended by 80 invited participants from 11 countries.

The information concerning imaging with different probes tends to remain enclosed within the frontiers of each specialized field. In response to the clear need for a collection and synthesis of information about the numerous, very distinct approaches to imaging which have been developed for different particles, the workshop aimed to bring together people from different fields so that each could contribute to, and benefit from, a common pool of knowledge. Personal contacts can help to throw bridges across the gaps separating neighbouring activities. This book aims to materialize these bridges by making this unique collection of material available to all physicists, biologists, materials scientists and others interested in "imaging".

Some papers in the book deal with more general aspects of the physics involved in imaging processes and especially with coherence and the theoretical formalism common to different particle probes. The bulk of the book describes sources, beam characteristics, interaction with matter, image formation, detection and processing. Finally some recent techniques (NMR imaging, nuclear scattering radiography, channeling) are described separately.

We have tried to make it as easy as possible for the reader to find his way into and around the many different subjects dealt with in this book by providing three means of access :

- 1) a table of contents in the publication order which closely follows the order of presentation at the workshop. This is based on the physical sequence in any probe experiment, (the *source* produces a *beam* which propagates through space then *interacts with matter*, etc.)

- 2) a table of contents by probe particle
- 3) an analytical index based on keywords.

Remembering that Les Houches is a beautiful mountain resort in the French Alps we have allowed ourselves the fantasy of including the text of a talk on the "Coherent Theory of Skiing". This talk encouraged many participants to ski for the first time and others to attempt to improve their existing capacities.

We would like to thank J. Joffrin, D. Thoulouze and M.Th. Beal-Monod who initiated the idea of the workshop, the staff at the Centre de Physique des Houches for so pleasantly looking after the material side of communal life, all the participants for making the meeting so friendly and interesting and, of course, particularly the authors of contributions appearing in this book.

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ALPHABETICAL SUBJECT INDEX

Absorption, Neutron	198, 318
Absorption, X-ray	135
Acoustic Activity	59, 154
Acoustic Attenuation	422
Acoustic Lens	422, 437
Acoustic Microscopy	420
Acoustic Scattering Center	434
Acoustic Waves, Polarized	59
Acoustical Echography	440
Acoustical Holography	438
Acoustics, Non-linear	59
Acousto-electronic Lens	442
Acousto-optical Deflector	151
Acousto-optical Interactions	147, 393
Acousto-optical Modulator	151
Activity, Acoustic	59, 154
Aerial Photograph Processing	494
Alpha Particles, Imaging with	374
Amplitude, Scattering	121, 132
Angular Amplification	246, 273
Anomalous Dispersion Corrections	134, 296, 328
Anomalous Scattering	328
Anomalous Transmission, Neutron	268
Anomalous Transmission, X-ray (Bormann Effect)	136, 244
Atomic Displacement by Electrons	531
Atomic Scattering Factor	132
Attenuation in Optical Fibers	216
Attenuation, Acoustic	422
Available Thickness in H.v.e.m.	401
Beam Modulation	327
Bethe Theory for Electron Inelastic Scattering	191
Biological Material, Electron Energy Loss Spectrum for	189
Biological Objects, Imaging in the E.m.	520
Bloch Waves	177, 239
Boersch Effect Energy Broadening of Electron Beams	35
Bonse-Hart Interferometer	293, 327
Booster, Fission	45
Born Approximation	122, 174, 199
Bormann Effect or Anomalous Transmission	136, 243, 295
Bragg Diffraction	233
Bragg or Reflection Case	244, 322
Bragg Scattering in Acoustics	152
Bragg's Law	235, 322, 381
Bremsstrahlung	51, 531
Bright Field Electron Microscopy	417
Brightness of Electron Source	29
Bursers' Vector Determination	302, 554
Cathodoluminescence Topography	529
Channel Electron Multiplier	515
Channelling	373
Characteristic Length	249, 302
Characteristic Parameters in X-ray Dynamical Theory	248
Characteristic X-ray Lines	51
Chemical Analysis Using Electron Microscopy	408
Classical Apples	106
Classical Treatment of Electron Scattering	403

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Coded Aperture Tomography	428
Coherence and Holography	359
Coherence of Electron Beam	28
Coherence, Degree of	67, 345
Coherence, Image Formation and	71, 414
Coherence, Laser	9
Coherence, Partial	64
Coherence, Spatiotemporal	70, 85, 86, 416
Coherent Generation of Phonons	160
Coherent Image Processing	490
Coherent Scattering, X-ray	132
Coherent States	279, 563
Coherent Theory of Skiing	113
Collision Processes, Elastic and Inelastic	182
Collision Theory, Formalism of	121
Comparison of Light and Electron Microscopy	85
Complementarity Principle	109
Compton Scattering	136
Computerized Axial Tomography	469
Conical Refraction Effect	59
Contrast in Electron Microscopy	338, 399, 412
Contrast in X-ray Image Detection	501, 504, 553
Conventional Transmission Electron Microscope (Ctem)	335
Correlation Function	201
Creation of New Wavefields	257, 303
Critical Voltage Effect in Electron Scattering	404
Cross-over from Electron Gun	32
Cross-section, Scattering	121, 132, 191, 227, 402
Cross-sections, X-ray Reaction	131, 226
Crystal Defects, Investigation of	252, 294, 299, 309, 318, 373
Crystal Diffraction	233, 248, 258, 267, 293, 299, 307, 317, 322, 368, 378, 551
Ctem and Stem, Comparison of	94
Ctem and Stem, Reciprocity between	93, 341
Ctem, Image Formation in	89, 339
Dark Field Electron Microscopy	340, 416
Dechannelling by Defects	373
Detection of Photons, Quantum Noise	355
Detective Quantum Efficiency (Dqe)	510
Detectors, Electron	509
Detectors, Infrared (Quantum, Thermal)	164
Detectors, Optical	477
Detectors, X-ray	499
Dichroism, X-ray	261
Diffraction Focusing	271, 370
Direct Image	301, 555
Dislocation Luminescence	536
Dispersion Corrections, Anomalous	134, 296, 328
Dispersion Surface	177, 242, 248, 262
Double Crystal X-ray Topography	305
Duality Principle	109
Dynamical Diffraction Theory	175, 233, 258, 267, 293, 404
Earthquake Detection by Laser	23
Echo	568
Echo Planar Imaging, N.m.r.	450
Echography, Acoustical	440
Echography, B-mode	398, 443
Effective Source in Electron Microscopy	89
Eikonal Approximation	174, 252
Elastic and Inelastic Collision Processes	182
Elastic Scattering in High Energy Electron Diffraction	172

Elastic Scattering,Schroedinger Equation for	121,172
Electrochromic Transducers	486
Electron Beam,Coherence of	28
Electron Detectors	509
Electron Diffraction	173
Electron Dose Effects on Structure of Biological Specimens	523
Electron Energy Loss Spectroscopy	195
Electron Energy Loss Spectrum for Biological Material	189
Electron Gun,Cross-over from	32
Electron Gun,Effective Source	86
Electron Holography	364
Electron Imaging,Transfer Theory of	414
Electron Inelastic Scattering	193
Electron Lenses	334
Electron Lenses,Wave Aberration Function for	90
Electron Micrographs,Fourier Analysis of	521,546
Electron Micrographs,Optical Diffractograms of	524
Electron Microscope Specimens	337
Electron Microscope(Stem),Scanning Transmission	336
Electron Microscope,Conventional Transmission	335
Electron Microscope,Description of	412
Electron Microscope,High Voltage	399
Electron Microscopy,Contrast in	338,412
Electron Microscopy,Dark Field	340,416
Electron Microscopy,Effective Source in	89
Electron Microscopy,Resolution in	333,342,399,416,542
Electron Multiplier,Channel	515
Electron Penetration in Solids	401,530
Electron Radiation Damage	342
Electron Scattering	126,172,182,338,402,511
Electron Scattering and Image Contrast	338
Electron Scattering by a Coulomb Potential	126
Electron Scattering,Dynamical Theory of	404
Electron Scattering,Optical Potential in	172
Electron Sources	28
Electronic Devices,Topographic Study	311
Electrons,Field and Thermal Emission of	32
Electrons,Helmholtz Equation for	86
Electrons,Image Intensifiers for	516
Electrons,Photographic Emulsion for	517
Electrons,Scintillation Counters for	516
Electrons,Solid State Detector for	515
Electrons,Thermionic Emission of	30
Electrooptical Image Detectors	504
Emulsions,X-ray Photographic	553
Energy Broadening of Electron Beams,Boersch Effect	35
Energy Loss Processes	182,402,531
Ensemble Average	280
Environmental Cells in Electron Microscopy	407
EXAFS	135
Expectation Value	279
Exposure Time for X-ray Topographs	308
Extinction,or Pendelloesung,Length	249,302
Eye,Sensitivity of	552
Faraday Cup	514
Faraday Effect,Acoustical	59
Fericon Transducers	487
Fermi Golden Rule	123
Fermi Pseudopotential	199
Ferroelectrics As Optical Recording Material	480

Field and Thermal Field Emission of Electrons	32
Fission	39
Fission Booster	45
Fission Fragments, Imaging with	375
Focusing in Diffraction by Imperfect Crystals	378
Focusing, Diffraction	271, 370
Formalism of Collision Theory	121
Forward Scattering Approximation in Electron Diffraction	173
Fourier Analysis of Electron Micrographs	521, 546
Fourier Transform of Helical Projection	521
Fraunhofer Electron Holography	365
Frequency Stabilized Lasers	17
Fresnel Diffraction	394
Fresnel Focusing	446
Fresnel Transform Device, Analogical	397
Geometric Aberrations	422
Geometrical Approximation To Wave Propagation	99
Geometrical Diffraction Theory	234
Grain Boundaries	374
Grain Boundary Dislocations, Topographic Study	310
Gravitational Effect on Neutrons	81, 297
Gravity Measurement by Laser	24
Green's Function	255, 435
Growth Defects, Topographic Study	308, 318
Guided Mode Propagation in Fibers	214
Guide-tube, Neutron	80, 318
Guinier-Preston Zones	377
Handwriting, Optical Processing of	493
Harmonic-free Monochromator	325
Helical Projection, Fourier Transform of	521
Helmholtz Equation for Electrons	86
High Energy Electron Diffraction, Elastic Scattering in	172
High Voltage Electron Microscopy (Hvem)	399
Holographic Memory	478, 572
Holographic Reconstruction	363
Holography, Acoustical	438
Holography, Electron	364
Holography, Optical	357
Holography, X-ray	368
Howie-Whelan Equations in Electron Diffraction	175
Hybrid Image Processing	492
Hydrogen Density Distribution	460
Image Formation and Coherence	71, 414
Image Formation in Ctem	89, 339
Image Formation in Stem	92, 340
Image Intensifiers for Electrons	516
Image Processing	490, 541
Image Reconstruction	393
Image Restoration	543
Image Treatment	507
Imaging in Three Dimensions, X-ray	231
Imaging Parameters for X-rays, Neutrons, Electrons	302, 400
Imaging Systems, Infrared	168
Imaging with Partially Coherent Illumination	74, 416
Imaging, Rose Condition for	542
Imaging, X-ray	226, 299, 307, 551
Incoherent Scattering	132, 200
Inelastic Electron Scattering	182, 182, 531
Inelastic Scattering, Electron	193
Inelastic Scattering, Neutron	204, 289, 380

Infrared Detectors, Noise (Johnson, Thermal, Background) in	165
Infrared Imaging Systems	168
Infrared (Quantum, Thermal) Detectors	164
integrated Intensity in X-ray Diffraction	237
integrated Optical Circuits	219
Interactions with Matter, X-ray	131
Interference	279
Interferometer, Bonse-Hart	293, 327
Interferometry, Applications in Astronomy	351
Interferometry, Intensity and Speckle	349
Interferometry, X-ray and Neutron	293, 370
inverse Scattering Problem in One Dimension	98
Jellium Model of Electron Inelastic Scattering	193
Karhunen-Loeve Transform Image Processing	495
Kinematical Diffraction Theory	234, 381
Kirchhoff Approximation	139
Land's Method	249, 300
Larmor Precession	81, 281
Lasers, Frequency Stabilized	17
Laser Coherence	9
Laser Modes	2
Laser Mode Locking	6
Laser Pulse	6
Laser Stability	17
Laser Stimulated Photon Emission	1
Lattice Parameter, Absolute Determination	295
Laue or Transmission Case	244, 322
Lean in Skiing	117
Lens, Acoustic	422, 437
Linac	45
Line-scan Imaging, N.m.r.	449
Liquid Crystal Optical Transducers	484
Lithium Niobate As Recording Material	482
Low-energy Electron Scattering	180
Macromolecules, Scattering by	206
Magnetic Domains and Walls, Topographic Study	311, 319
Magnetic Resonance, Imaging by Nuclear	449
Magnetic Scattering, Neutron	202, 319
Magnetooptic Recording Material	481
Majorana Flipper	288
Malus' Law, Acoustic	58
Mean Free Paths for Electrons	184
Memory, Holographic	478, 572
Microanalysis Using Electron Energy Loss	195
Microradiography	229
Microscopy, Acoustic	420
Microscopy, Comparison of Light and Electron	85
Microscopy, X-ray	226, 371
Mode Locking, Laser	6
Moderation, Neutron	41
Momentum Space	381
Monochromators, Neutron	380
Mosaic Spread	381
Multi-slice Method in Electron Diffraction	175
N.m.r. Imaging	449
Negative Staining Technique	520
Neutron Absorption	198, 318
Neutron Bottle	79
Neutron Guide-tube	80, 318
Neutron Incoherent Scattering	200

Neutron Inelastic Scattering	204,289,380
Neutron Interferometry	293
Neutron Moderation	41
Neutron Monochromators	380
Neutron Polarization	79,279
Neutron Sources	37
Neutron Spin	280
Neutron Topography	317
Neutrons,Ultracold	79
Noise (Johnson,Thermal,Background) in Infrared Detectors	165
Noise in Gamma-ray Tomography	431
Noise,Effect on Phase Contrast Imaging	541
Non-linear Acoustics	59
Non-linear Optical Processes	8
Nuclear Scattering of Protons	460
Nuclear Scattering,Neutron	198
One Diffusion Process Approximation	435
Optical Detectors	477
Optical Diffractograms of Electron Micrographs	524
Optical Fibers	213
Optical Holography	357
Optical Potential in Electron Scattering	172
Optical Potential,Neutron	78
Optics,Ultrasonic	57
Parabolic Equation Method	98
Parametric Arrays	61
Partial Waves and Phase Shifts	123
Partially Coherent Illumination,Imaging with	74,416
Particle Concept	106
Pendelloesung	294
Pendelloesung Fringes	244,262,300,314
Pendelloesung,or Extinction,Length	249,302
Penetration in Solids,Electron	401,530
Phase and Amplitude Transfer Functions	413
Phase Contrast Topography	297
Phase Filter	543
Phase Measurements	327,369
Phase Object Approximation in Electron Diffraction	174
Phase Operator	562
Phase Shifts,Born Approximation for	124
Phonon Echo	571
Phonons	157
Photochromic Recording Material	481
Photographic Detector for Charged Particles	374
Photographic Emulsion for Electrons	517
Photographic Emulsion for X-rays	501
Photon Noise	504
Photosensitive Materials,X-ray	229,507
Phototitis Transducers	488
Pivoting,Ski	116
Planar Defect	252,304
Plastic Deformation,Topographic Study	315
PLZT As Recording Material	482
Pockels Effect	59
Polarization,Neutron	79,279
Polarization,X-ray	258
Polarized Acoustic Waves	59
Polarized Neutron Topography	319
Polarizer,X-ray	328
Poynting Vector	243,303

PROM Transducers	488
Proton Channelling	374
Proton N.m.r. Imaging	450
Proton Radiography	459
Protons, Nuclear Scattering of	460
Pseudopotential, Fermi	199
Pulsed Plasma Sources	54, 226
Pulsed Reactor	45
Pulse, Laser	6
Quanta	106
Quantum Mechanics of Electron Inelastic Collisions	189
Quantum Potatoes	106
Quantum Transducers, Phonon	159
Radiation Damage in Electron Microscopy	523
Radiation Damage in High Voltage Electron Microscopy	407
Radiative Processes	532
Radiography, Proton	459
Radius of Gyration	208
Rainbow Holography	359
Ray Theory for a Perfect Crystal	250
Ray Theory in Perfect Crystals	241
Rayleigh Scattering in Optical Fibers	216
Reactor, Fission	39
Reciprocal Space, Focusing in	378
Reciprocity Between Ctem and Stem	93, 341
Reconstruction, Holographic	363
Recording Materials in Optics	477
Recrystallization, Topographic Study	310
Reference Wave in Holography	362
Reflection (Bragg) Case in Bragg Diffraction	244, 322
Reflection (Bragg) Topography	299
Reflection Acoustic Microscope	424
Refraction, X-ray	323
Refractive Index in Scattering Processes	128
Refractive Index, X-ray and Neutron	77, 241, 296
Relativistic Effects in Electron Scattering	172
Relaxation Time	567
Resolution Function in Neutron Scattering	385
Resolution in Electron Microscopy	333, 342, 399, 416, 542
Resolving Power	503
Restoration of Electron Images	543
Rocking Curve	235
Rose Condition for Imaging	542
Rotatory Power, X-ray	261
Scanner	469
Scanning Transmission Electron Microscope (Stem)	336, 417
Scattering Amplitude	121, 132, 198
Scattering and Energy Loss Effect on Electron Detection	511
Scattering by Randomly Rough Surfaces	141
Scattering Cross-section	121, 132, 191, 227, 402
Scattering Length	198, 296
Scattering of Slow Particles	125
Scattering Potential, Neutron	78
Schrodinger Equation for Elastic Scattering	121, 172
Schrodinger Equation for Electrons	85
Scintillation Counters for Electrons	516
Section Topograph	301, 319, 553
Sensitivity of Eye	552
Side Cut in Skis	114
Simulation of X-ray Topographs	556

Single Loss Electron Inelastic Scatterings	186
Single Side-band Electron Holography	365
Ski Boots and Skis	114
Skis, Coherent Theory of	113
Slow Particles, Scatterings of	125
Small Angle Scatterings	206
Solid State Detector for Electrons	515
Sources, Electron	28
Sources, Neutron	37
Sources, Ultrasonic	57
Sources, X-ray	51
Spallation Neutron Source	46
Spatiotemporal Coherence	70, 85, 86, 416
Spatiotemporal Holography	360
Speckle, Applications in Astronomy	353
Spectroscopic Applications of Stabilized Lasers	24
Spectroscopic Instruments, X-ray	324
Spectroscopy, Ultrasonic	138
Spherical Wave	245
Spin Echo, Neutron	290, 569
Spin, Neutron	280
Spinor Rotation Experiments	297
Statistical Analysis in Image Processing	495
Steering of Skis	116
Stem, Image Formation in	92, 340
Stereo Images	301, 555
Stern-Gerlach Experiment	284
Stimulated Phonon Emission	160
Stimulated Photon Emission, Laser	1
Storage Rings, Electron	54
Storage Rings, Neutron	83
Structure Factor	134, 235
Superfluidity	564
Supermirror for Neutrons	79
Surface Waves, Ultrasonic	61
Synchrotron Radiation	52, 226, 264, 296, 305, 499
Takasi's Equations	255, 556
Thermal Diffuse Scatterings	204
Thermal Radiations, Statistical Properties	344
Thermal Transducers, Phonon	158
Thermionic Emission of Electrons	30
Thermoelastic Recording Material	481
Three-dimensional Imaging, X-ray	231
Three-dimensional Structure from Electron Micrographs	522
Tomography	231, 428, 469
Topography, Cathodoluminescence	529
Topography, Interpretation of, X-ray	551
Topography, Neutron	317
Topography, Phase Contrast	297
Topography, X-ray	299, 307
Total Reflection, Neutron	79
Transducers, Optical	483
Transducer Array	437
Transfer Functions, Phase and Amplitude	413
Transfer Theory of Electron Imaging	414
Transmission (Laue) Case in Brass Diffraction	244, 322
Transmission (Laue) Topography	299, 307, 317, 551
Transmission Acoustic Microscope	421
Transmission Function for Electron Transparent Objects	90, 414
Traversal Topograph	301, 553