## Contents

Part I	Introductory Lecture	
	ent Developments in DIET nzel (With 5 Figures)	2
Part II	Gas Phase	
Molecules: By I. Nen:	ociation and Photoionization Processes of Core Excited: The CH <sub>3</sub> Br Case ner, P. Morin, M. Simon, P. Lablanquie, 3. de Souza (With 14 Figures)	10
.,	ctron-Ion Coincidence Studies on Free Molecules erhardt and R. Murphy (With 3 Figures)	32
Deuteriun	Stimulated Desorption of $D_n^+$ Clusters from Condensed a Layers on Pd(111) Between 5 and 20 K stulen (With 5 Figures)	39
-	n Processes in Planetary Science	47
	ective Photochemistry with Monochromatic Soft X-Rays Hanson	50
Part III	Neutrals and Negatives	
Radiation By P. Feu	imulated Desorption of Neutrals by Synchrotron from Chemisorbed, Physisorbed, and Condensed Layers lner, S. Auer, T. Müller, A. Puschmann, and D. Menzel igures)	58
Rovibrational Laser Spectroscopy of ESD Neutrals from Chemisorbed Species By A.R. Burns, E.B. Stechel, and D.R. Jennison (With 5 Figures)		67

Electron Stimulated Desorption of Excited Hydrogen Atoms from an Alkali Promoted Surface By P.D. Johnson, X. Pan, J. Tranquada, S.L. Hulbert, and E. Johnson (With 2 Figures)	73
Dissociative Attachment in ESD from Condensed Molecules By L. Sanche (With 8 Figures)	78
Image Charge, Coherent Scattering, and Symmetry Effects in Electron Stimulated Desorption: O – from O <sub>2</sub> Condensed on Metals By D.E. Ramaker and H. Sambe (With 6 Figures)	85
Techniques for the Detection of Photodesorbed Negative Ions By C.E. Young, E.L. Schweitzer, M.J. Pellin, D.M. Gruen, Z. Hurych, P. Soukiassian, M.H. Bakshi, and A.S. Bommannavar (With 3 Figures)	94
Part IV Electron Stimulated Desorption Ion Angular Distribution (ESDIAD)	
Observation of Molecular Rotors on Surfaces by ESDIAD: Studies of PF <sub>3</sub> and NH <sub>3</sub> Chemisorption on Ni Surfaces By J.T. Yates, Jr., M.D. Alvey, M.J. Dresser, AM. Lanzillotto, and K.J. Uram (With 8 Figures)	100
The Influence of Surface Structure on Mechanisms of Stimulated Desorption By R.L. Kurtz, R. Stockbauer, and T.E. Madey (With 5 Figures)	109
DIET in the Second Layer: An ESDIAD Study of NH <sub>3</sub> on a CO Layer on Ni(111) and Ni(110)  By M.J. Dresser, AM. Lanzillotto, M.D. Alvey, and J.T. Yates, Jr. (With 3 Figures)	115
ESDIAD of Small Molecules on Surfaces: A Few Caveats By T.E. Madey, M. Polak, A.L. Johnson, and M.M. Walczak (With 5 Figures)	120
An Ellipsoidal Mirror Analyzer for the Study of Photon Stimulated Desorption By R. Stockbauer, R.L. Kurtz, and T.E. Madey (With 1 Figure) .	126
Digital Video Data Acquisition/Analysis for Existing ESDIAD Apparatus By A.L. Johnson, R. Stockbauer, D. Barak, and T.E. Madey (With 3 Figures)	130

Part V Theory	
Dynamics in Neutral DIET from Chemisorbed Molecules By E.B. Stechel, D.R. Jennison, and A.R. Burns (With 3 Figures)	136
The Nature of Repulsive States and the Role of Nuclear Dynamics in Desorption Induced by Electronic Transitions By Ph. Avouris, R. Walkup, R. Kawai, D.M. Newns, and N.D. Lang (With 7 Figures)	144
The Dynamics of O <sup>+</sup> Desorption from TiO <sub>2</sub> By R.E. Walkup and R.L. Kurtz (With 4 Figures)	160
DIET and the Electronic Structure of Chemisorbed Molecules and Physisorbed Rare Gases By D.R. Jennison, E.B. Stechel, and A.R. Burns	167
Theory of Desorption of Neutrals by Temporary Ionization of Physisorbed Species at Metal Surfaces By Z.W. Gortel, H.J. Kreuzer, P. Feulner, and D. Menzel (With 6 Figures)	173
The Magnitude of Secondary Electron Contributions in Photon Stimulated Desorption By D.E. Ramaker, T.E. Madey, R.L. Kurtz, and H. Sambe	182
Interatomic Auger Rates for the Sodium Fluoride Crystal By T.A. Green and D.R. Jennison	18
Part VI Spectroscopy	
Ultraviolet Surface Photochemistry and Charge Transfer By E.P. Marsh, F.L. Tabares, M.R. Schneider, and J.P. Cowin (With 3 Figures)	190
Chemically Induced Desorption of Nickel Oxide and Carbide by 5-200 eV C+ and O+ Ion Bombardment By H. Kang, S.R. Kasi, O. Grizzi, and J.W. Rabalais (With 6 Figures)	196
PSID SEXAFS Studies of Silicon Surface Chemistry By G. Thornton, D.R. Warburton, R. McGrath, I.T. McGovern, and D. Norman (With 3 Figures)	205
Photon Stimulated Desorption from Oxidized Al(110) By E.D. Johnson, R.F. Garrett, M.L. Knotek, and F. Sette	
(With 9 Figures)	210

Stimulated Description from CO Chemisorbed on Cr(110): Sensitivity to Bonding Changes By N.D. Shinn and T.E. Madey (With 2 Figures)	217
Temperature-Dependent PSD of H+ from H <sub>2</sub> O/Si(111) (7×7) By R.A. Rosenberg, CR. Wen, and D.C. Mancini (With 4 Figures)	220
Electronic Sputtering and Its Application to SIMS Analysis of Biomolecular Monolayers By B.U.R. Sundqvist, A. Hedin, P. Håkansson, G. Jonsson, and G. Säve (With 3 Figures)	225
Limits of Applicability of the Popcorn Model for Desorption of Large Biomolecules by Fast Ion Impact By P. Williams and B.U.R. Sundqvist	230
Photon-Stimulated Desorption in High Electric Fields By S. Jaenicke, A. Ciszewski, J. Dösselmann, W. Drachsel, J.H. Block, and D. Menzel (With 4 Figures)	236
Observations of Photon-Induced Gas Desorption from Technological Materials Using Synchrotron Light By E.M. Williams (With 3 Figures)	242
Part VII Insulators	
The Origin of Positive Ions and Excited Neutrals in Electron Stimulated Desorption from Alkali Halides By R.E. Walkup, Ph. Avouris, and A.P. Ghosh (With 5 Figures)	248
Ion Desorption Induced by Core Exciton States in MgO By R.L. Kurtz, R. Stockbauer, F. Senf, R. Nyholm, and S. A. Flodström (With 3 Figures)	258
Studies of Sapphire Photoablation by Laser-Induced Fluorescence and Photothermal Deformation Measurement By R.W. Dreyfus, F.A. McDonald, and R.J. von Gutfeld (With 5 Figures)	262
Multiphonon-Induced Desorption from BaF <sub>2</sub> (111) By H.B. Nielsen, J. Reif, E. Matthias, E. Westin, and A. Rosén (With 9 Figures)	266
PSD of Excited Hydrogen From KCl By L.T. Hudson, A.V. Barnes, N.J. Halas, R.F. Haglund, M.H. Mendenhall, P. Nordlander, N.H. Tolk, Y. Wang,	
and R.A. Rosenberg (With 4 Figures)	274

Ground-State and Excited Atom Production by Electron and Ion	
Bombardment of NaCl and CaF <sub>2</sub>	
By G. Betz, E. Wolfrum, P. Wurz, K. Mader, B. Strehl,	
W. Husinsky, R.F. Haglund, Jr., and N.H. Tolk (With 4 Figures)	278
Optical Radiation from Electron, Photon and Heavy Particle Bombardment of Lithium Fluoride and Lithium-Dosed Surfaces By N.H. Tolk, R.G. Albridge, A.V. Barnes, R.F. Haglund, Jr., L.T. Hudson, M.H. Mendenhall, D.P. Russell, J. Sarnthein, P.M. Savundararaj, and P.W. Wang (With 5 Figures)	284
Long Lifetime of Bulk Luminescence Observed in Spectrosil Glasses Under Electron Bombardment By P.W. Wang, R.F. Haglund, Jr., L.T. Hudson, D.L. Kinser,	
M.H. Mendenhall, N.H. Tolk, and R.A. Weeks (With 6 Figures)	289
Index of Contributors	295