

## 第2回 IUPAP/UNESCO

### 半導体シンポジウム

—表面と界面—

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### Second IUPAP/UNESCO Semiconductor Symposium

—SURFACES and INTERFACES:  
Physics and Electronics—

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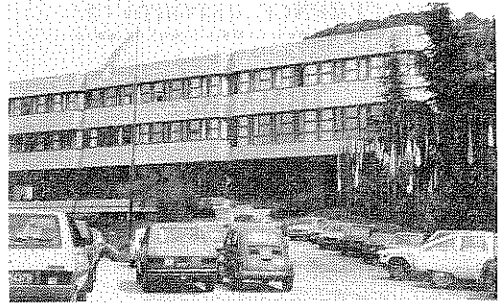
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このシンポジウムは1982年8月30日(月)から9月3日(金)の5日間北イタリアのTriesteの理論物理国際センター(International Center for Theoretical Physics)で開催された。この国際センターはその名の示す如く、国際連合教育、科学、教養機構、国際原子力機構等に所属する国際研究所である。この研究所の目的は、科学の基礎から2次の工業技術にいたる教育訓練を含めて世界の平和と守全のための活動を援助することであり、基礎および応用科学のためのシンポジウム等の各種の主題について、各年次に開かれている。たとえば、

- (a) Physics and frontiers of knowledge
- (b) Physics and energy
- (c) Physics and technology
- (d) Physics of the environment and of natural resources
- (e) Applicable mathematics and planning models
- (f) Physics teaching

などから、適当な主題がえらばれるらしく、昨年度はBiophysicsのシンポジウムが行われ、今年は“Surface and Interface”が主題となった。このシンポジウムのスポンサーと組織委員会等は次の如きものであった。

- (i) Sponsored by:  
Committee for Joint IUPAP-UNESCO  
Semiconductor Activities at Trieste  
A. Frova, Chairman, P.N. Butcher,  
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会場 ICTP (Trieste, Italy)

- (ii) Supported by:  
Italian National Research Council (CNR),  
IUPAP Semiconductor Commission, IBM-Italy,  
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- (iii) Organized in cooperation with Gruppo Nazionale di Struttura della Materia del CNR  
Organizing Committee:  
R. S. Bauer, Palo Alto, Chairman, G. Chiarotti,  
Rome, A. Frova, Rome, Y. Petroff, Orsay,  
H. J. Queisser, Stuttgart, F. W. Saris, Amsterdam,  
E. Tosatti, Trieste, R. Ueda, Tokyo

さて本題に入ると、プログラムはTable 1に示す通りであったが表面構造と電子物性、吸着構造と界面安定性、界面構造とショットキー・バリヤー、シリサイドの界面構造、半導体界面の形成過程、界面における電子捕獲過程、ヘテロ構造と超構造の成因とヘテロ接合、界面のサブミクロン・バンド構造等が、主な論題として取り上げられた。参加者は世界30国200名程度であった。

プログラムから判るように、界面の成因・構造・電子物性に討論の主題が置かれた。これは昨年アメリカにおけるA.I.P.主催Physical Electronics Conference(本誌Vol. 2, No. 4 p. 300~302参照)と同様であった。現在世界における表面・界面研究の大きな動向を示すものと考えられる。このシンポジウムの直前に東京でMBE-CST-2および国際Topical Conference(本誌本号参照)が開催され、講演者や主題の選択に関してTrieste会議のR. S. Bauer(Xerox, Palo Alto)とTokyo会議の筆者らとの間に多くの交渉経過がもたれたが、それは現在の“表面と界面”の会議の進歩発展状況の側面を示すものであると考えられる。

このシンポジウムの結果は、“Surface Science”(North-Holland社刊)の特集号に集録され、発刊されることになっている。

Table 1 PROGRAM

Monday, August 30 AM (9:50—12:45)		"Schottky Barriers: Models and 'Tests'" (30 min.) M. J. Thompson, Palo Alto "Schottky Barrier Amorphous-Crystalline Interface Formation?"
Symposium Opening		CONFERENCE RECEPTION
<b>"DEPENDENCE OF ELECTRONIC PROPERTIES ON SURFACE GEOMETRY"</b> Discussion Leader: D. R. Hamann, Murray Hill K. Jacobi, Berlin Subject: III-V Semiconductor Surfaces (30 min.)		Wednesday, September 1 AM (9:20—12:45)
BREAK (10:45 to 11:15)		<b>"SILICIDE INTERFACE STRUCTURE"</b> Discussion Leader: E. Tossati, Trieste
ROUND TABLE: (F. Himpsel, Yorktown Heights) "Si(111): $\pi$ -Bonding, K. C. Pandey, Yorktown Heights Buckling. (G. V. Hansson, Linkoping) Correlations (Y. Petroff, Orsay) or?" (D. J. Chadi, Palo Alto)		G. Ottaviani, Modena Subject: Metallurgical Aspects of Silicide Barriers R. Tromp, Amsterdam "Ion Beam Analysis of Metal-Silicon Interfaces" (30 min.)
PM (4:45—7:00)		BREAK (10:45 to 11:15)
<b>"SURFACE DEFECTS"</b> Discussion Leader: J. D. Dow, Urbana		G. Rubloff, Yorktown Heights "Microscopic Properties and Behavior of Silicide Interfaces" (40 min.) L. Braicovich, Milan Subject: Discrepancies among Experimental Probes of Silicide Interfaces
M. Henzler, Hannover "LEED Spot Profile Analysis of Defects at the Silicon Surface" W. Monch, Duisburg "Chemisorption-Induced Defects at Interfaces on Compound Semiconductors" (35 min.) R. Williams, Coleraine Subject: Semiconductor Surface Defects and the Electrical Properties of Metal Contacts (35 min.)		PM (4:45—7:00)
Tuesday, August 31 AM (9:20—12:45)		<b>"FORMATION OF SEMICONDUCTOR INTERFACES"</b> Discussion Leader: R. Ueda, Tokyo
<b>"TRANSITION FROM CHEMISORPTION TO STABLE INTERFACE STRUCTURE"</b> Discussion Leader: C. Calandra, Modena		M. G. Legally, Madison "Thermodynamics of Epitaxial Layer Formation" (30 min.) P. M. Petroff, Murray Hill Subject: Clustering at MBE Interfaces and the 'Surface' Phase Diagram A. Maduhkar, Los Angeles "Vapor Phase Epitaxial Formation of Interfaces Between Tetrahedral Semiconductors under Far from Equilibrium Conditions" R. Heckingbottom, Ipswich "Growth and Doping of GaAs Using MBE: Thermodynamic and Kinetic Aspects"
R. Ludeke, Yorktown Heights "The Formation of Interfaces on GaAs and Related Semiconductors: A Reassessment" (40 min.) G. Le Lay, Marseille "The Noble Metal/Semiconductor Systems: From Diffuse to Sharp Interfaces"		Thursday, September 2 AM (9:20—12:45)
BREAK (10:45 to 11:15)		<b>"TRAP STATES AT INTERFACES"</b> Discussion Leader: S. Makram-Ebeid, Limeil-Brevannes
L. Ley, Stuttgart "Stoichiometry of the Growing a-Si-oxide Surface" H. Wagner, Julich "Water and Oxygen Adsorption on Silicon Surfaces Studied by High Resolution Electron Energy Loss" P. Citrin, Murray Hill "Local Structure of Adsorbates on Semiconductor Surfaces Using SEXAFS"		H. Wieder, San Diego "Surface Fermi Level of III-V Compound Semiconductor-Dielectric Interfaces" (40 min.) D. E. Aspnes, Murray Hill "Recombination at Interfaces"
PM (4:45—6:15)		BREAK (10:45 to 11:15)
<b>"SYSTEMATICS OF SCHOTTKY BARRIERS"</b> Discussion Leader: G. Chiarotti, Rome		M. Schulz, Erlangen "Interface States at the Si-SiO <sub>2</sub> Interface" (40 min.) T. C. McGill, Pasadena "Dipoles, Deep Levels and Interfaces"
L. J. Brillson, Webster "Systematics of Chemical Structure and Schottky Barriers at Compound Semiconductor-Metal Interfaces" J. L. Freeout, Yorktown Heights		PM (4:45—7:00)
<b>"HETEROSTRUCTURES AND SUPERLATTICES"</b> Discussion Leader: P. Ruden, Stuttgart		

G. Margaritondo, Madison

"The Heterojunction Parameters from a Microscopic Point of View"

R. S. Bauer, Palo Alto

"Is the Band-Gap Discontinuity 'Adjustable'?"

H. Stormer, Murray Hill

"Electrical Transport in Heterojunctions and Superlattices" (35 min.)

F. Capasso, Murray Hill

"New Device Applications of Band Edge Discontinuities in Multi-Quantum Well and 'Saw-Tooth' Superlattice Structures"

Friday, September 3

AM (9:20—12:45)

**"EFFECTS OF INTERFACES  
IN SUBMICRON STRUCTURES"**

Discussion Leader: D. K. Ferry, Colorado State

H. Kroemer, Santa Barbara

"Hetero-Interfaces Inside Devices: The Interrelation Between Nanostructure and Device Performance" (40 min.)

F. Stern, Yorktown Heights

"Carrier Confinement Effects"

BREAK (10:45 to 11:15)

H. L. Grubin, Glastonbury

"The Effects of Boundary Constraints on Micron and Submicron Length Semiconductor Devices" (40 min.)

P. Hesto, Orsay

Subject: Schottky Barrier Injection and Quasiballistic Electron Transport

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