SWTW

IEEE SW Test Workshop

Semiconductor Wafer Test Workshop

June 9 - 12, 2013 | San Diego, California

Welcome to the 23rd Annual IEEE SW Test Workshop

IEEE

CPMT

IEEE COMPONENTS, PACKAGING AND MANUFACTURING TECHNOLOGY SOCIETY

Jerry Broz, Ph.D.

SW Test General Chair

Twenty-Three Years of Probe Technology

Many thanks to all of the 5000+ attendees

from around the world !

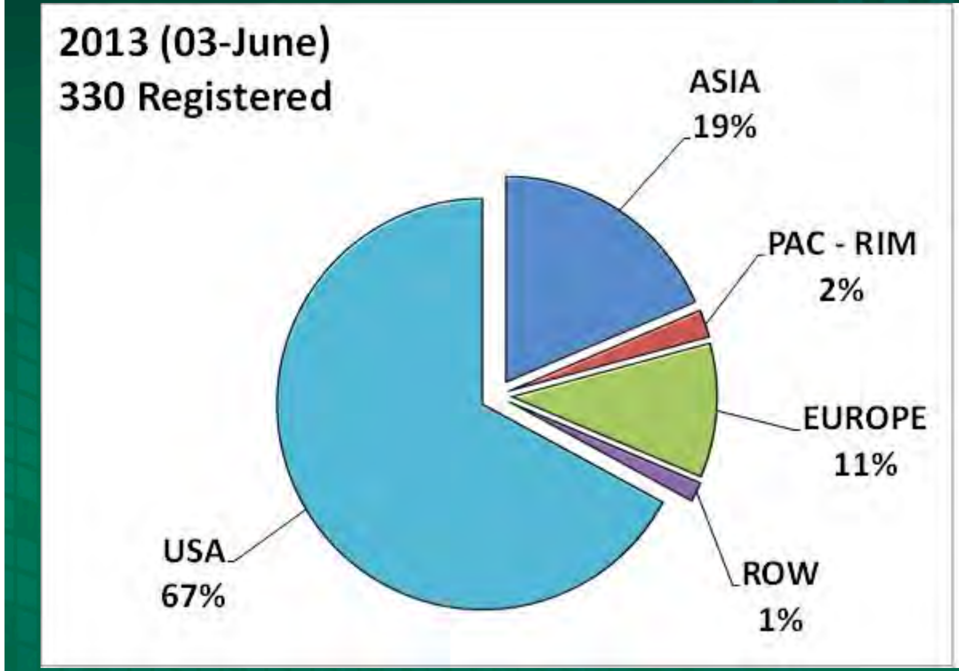
IEEE SW-Test Workshop

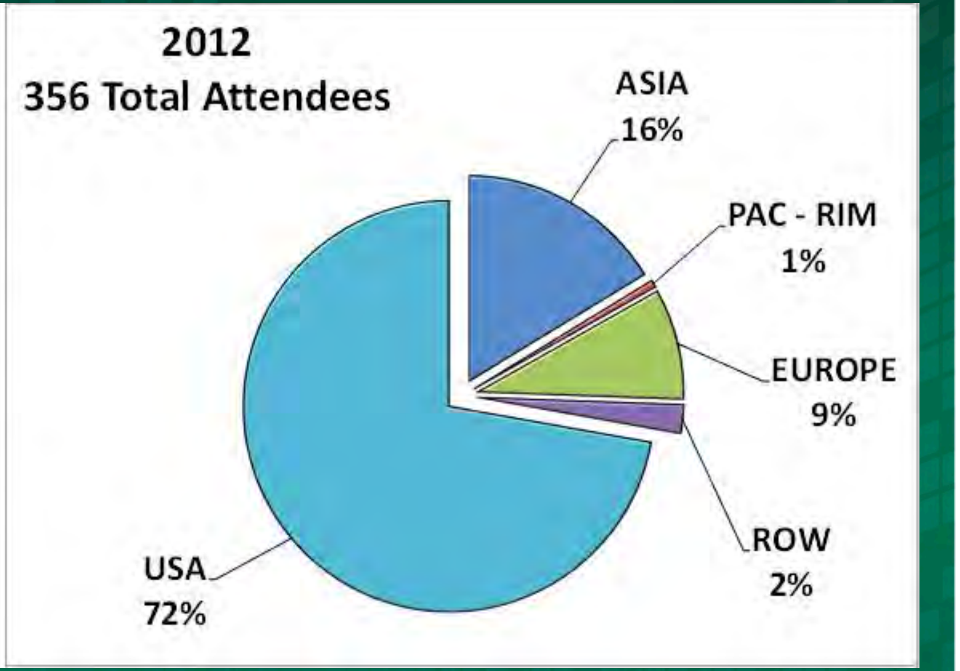
- **SW Test IS a Probe Technology Forum …**
  - It is "***<u>THE</u>***" Conference for Wafer Test Professionals
  - Practical solutions to real problems
  - Balanced mixture of semiconductor manufacturer, and supplier as well as collaborative presentations
- **Informal Conference …**
  - Grass roots workshop focused technical exchange
  - Great social activities and informal discussions
  - Meet new people and have a little fun !
- **Continue to adopt a "Green Initiative" …**
  - E-Proceedings and enviro-friendly practices

SW Test 2013 e-Proceedings ?

- **Memory drives have been written and have been shipped … BUT, have not arrived been delivered !**
- **Download the 2013 e-Proceedings, go to the SW Test website …**
  - http://www.swtest.org
  - SSID: NETGEAR64
  - PWD: vastteapot694
- **Memory drives should be available on Monday ?**

Attendance in 2013 is Strong !





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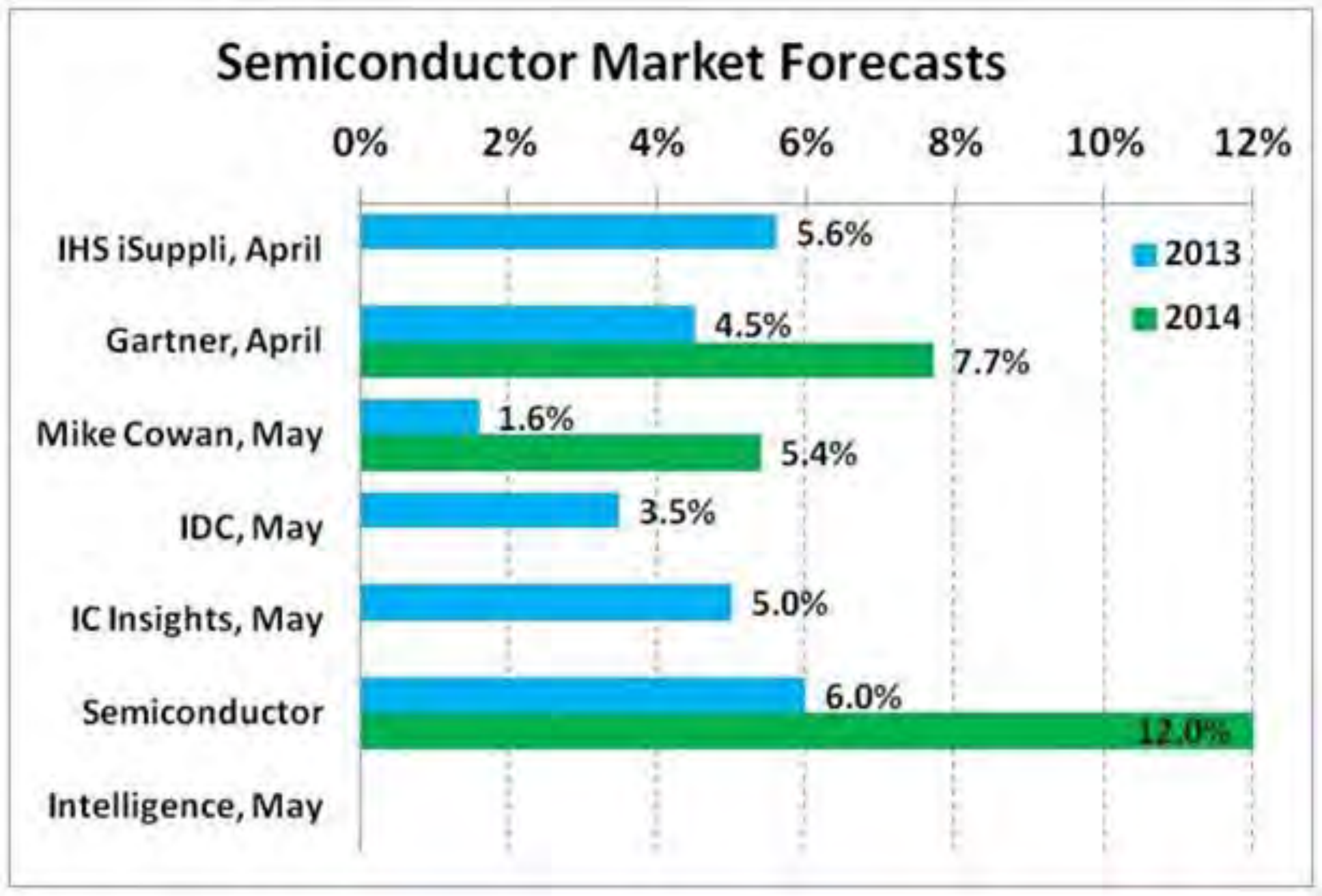
Industry Snapshot

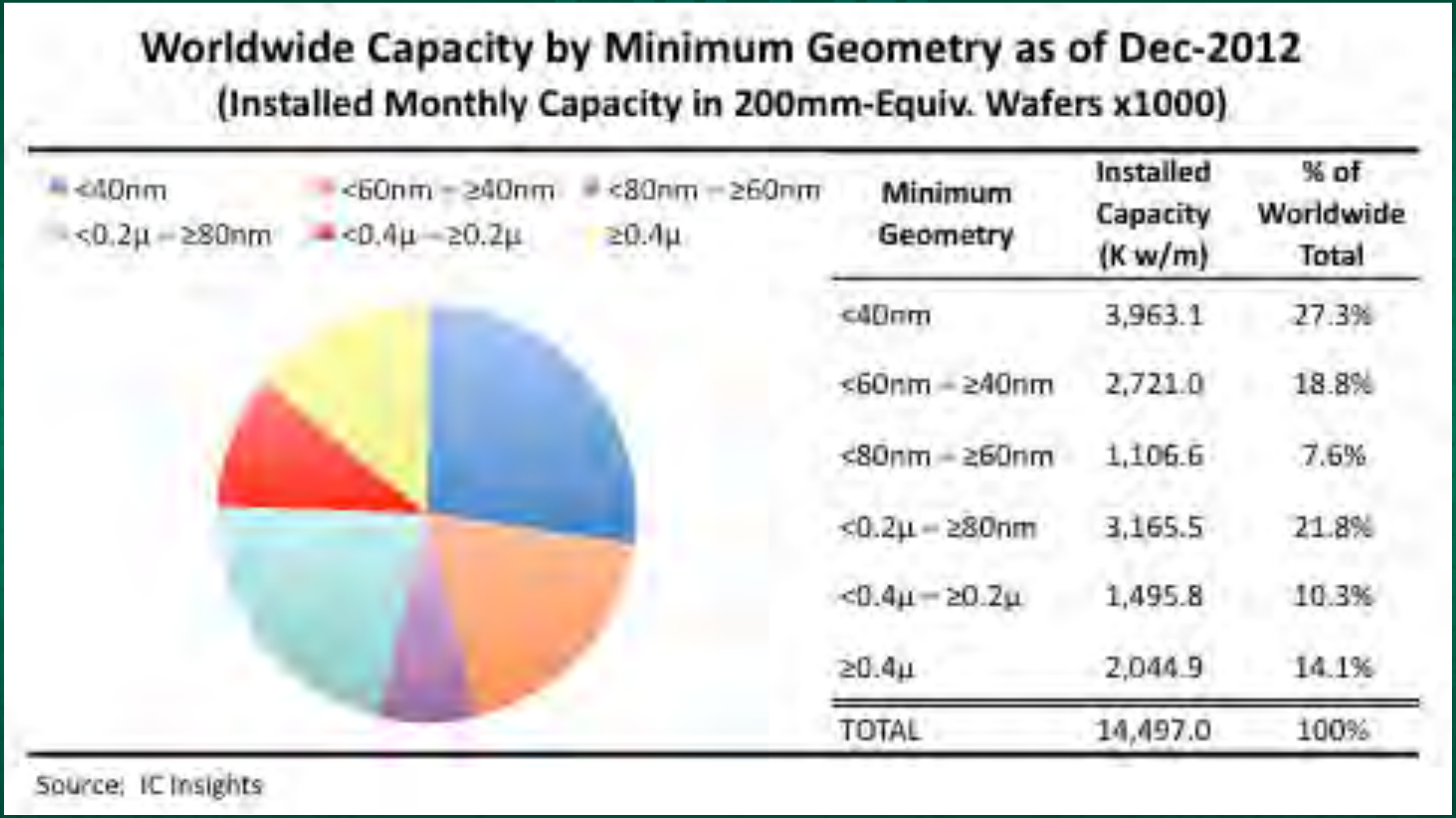
IC Market Growth Forecast by Application
(2011-2016 CAGR)

Source: IC Insights

Semi-Revenue Growth Forecast



World-Wide Capacity



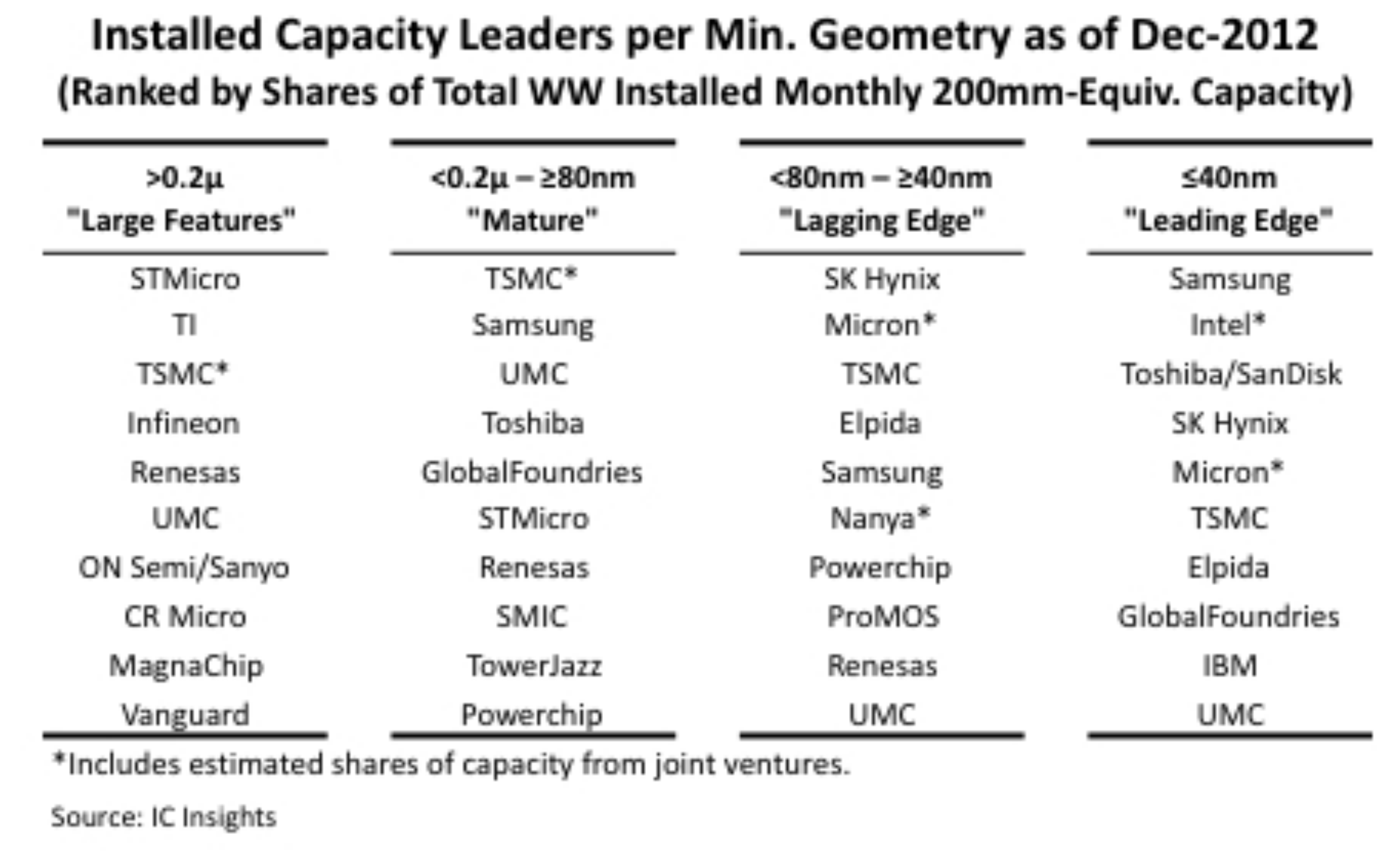
Worldwide Capacity by Minimum Geometry as of Dec-2012

(Installed Monthly Capacity in 200mm-Equiv. Wafers x1000)

Minimum Geometry	Installed Capacity (K w/m)	% of Worldwide Total
<40nm	3,963.1	27.3%
<60nm – ≥40nm	2,721.0	18.8%
<80nm – ≥60nm	1,106.6	7.6%
<0.2µ – ≥80nm	3,165.5	21.8%
<0.4µ – ≥0.2µ	1,495.8	10.3%
≥0.4µ	2,044.9	14.1%
TOTAL	14,497.0	100%

Source: IC Insights

World-Wide Capacity



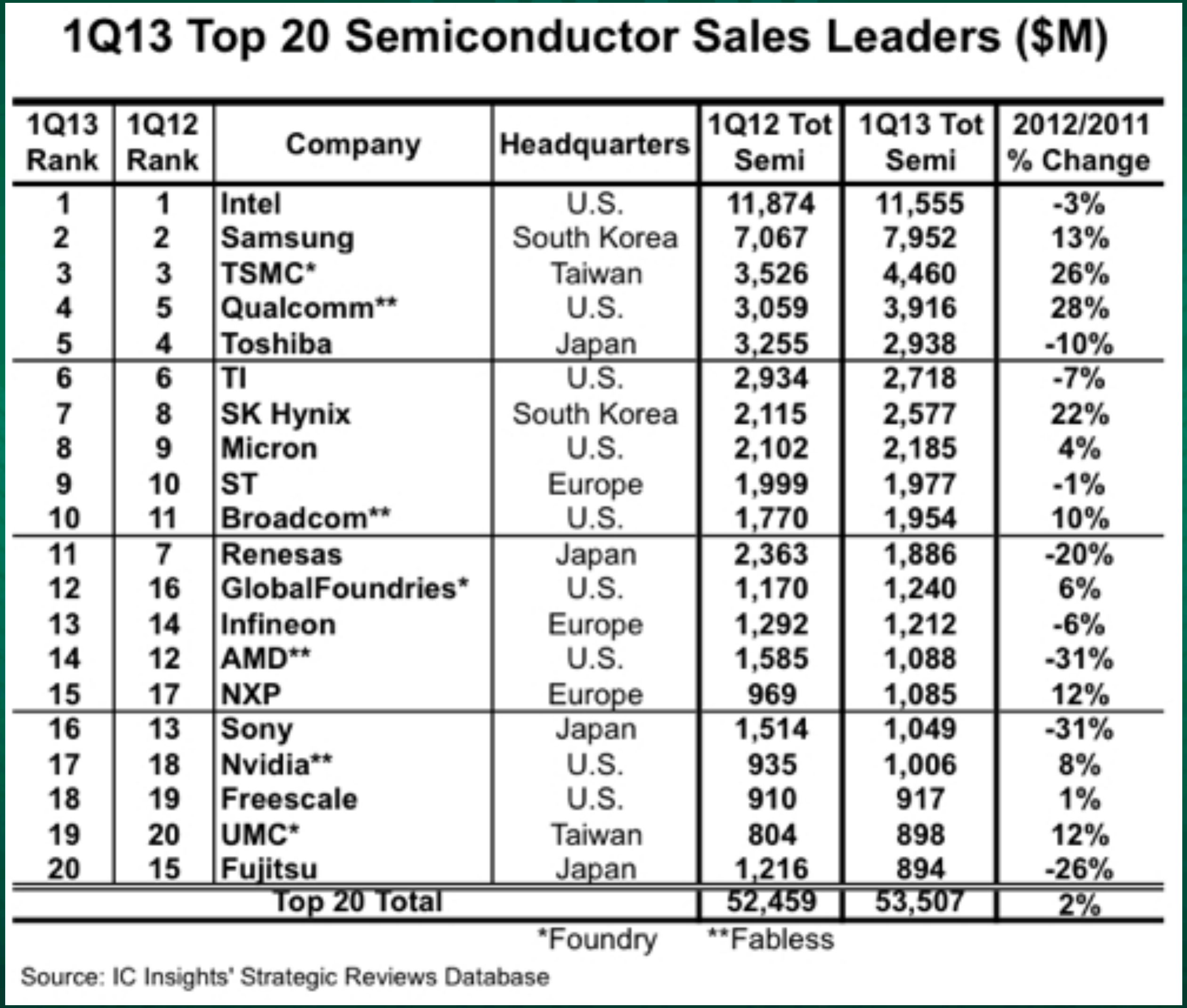
Installed Capacity Leaders per Min. Geometry as of Dec-2012
(Ranked by Shares of Total WW Installed Monthly 200mm-Equiv. Capacity)

>0.2µ "Large Features"	<0.2µ – ≥80nm "Mature"	<80nm – ≥40nm "Lagging Edge"	≤40nm "Leading Edge"
STMicro	TSMC*	SK Hynix	Samsung
TI	Samsung	Micron*	Intel*
TSMC*	UMC	TSMC	Toshiba/SanDisk
Infineon	Toshiba	Elpida	SK Hynix
Renesas	GlobalFoundries	Samsung	Micron*
UMC	STMicro	Nanya*	TSMC
ON Semi/Sanyo	Renesas	Powerchip	Elpida
CR Micro	SMIC	ProMOS	GlobalFoundries
MagnaChip	TowerJazz	Renesas	IBM
Vanguard	Powerchip	UMC	UMC

*Includes estimated shares of capacity from joint ventures.

Source: IC Insights

Top Semi-Producers



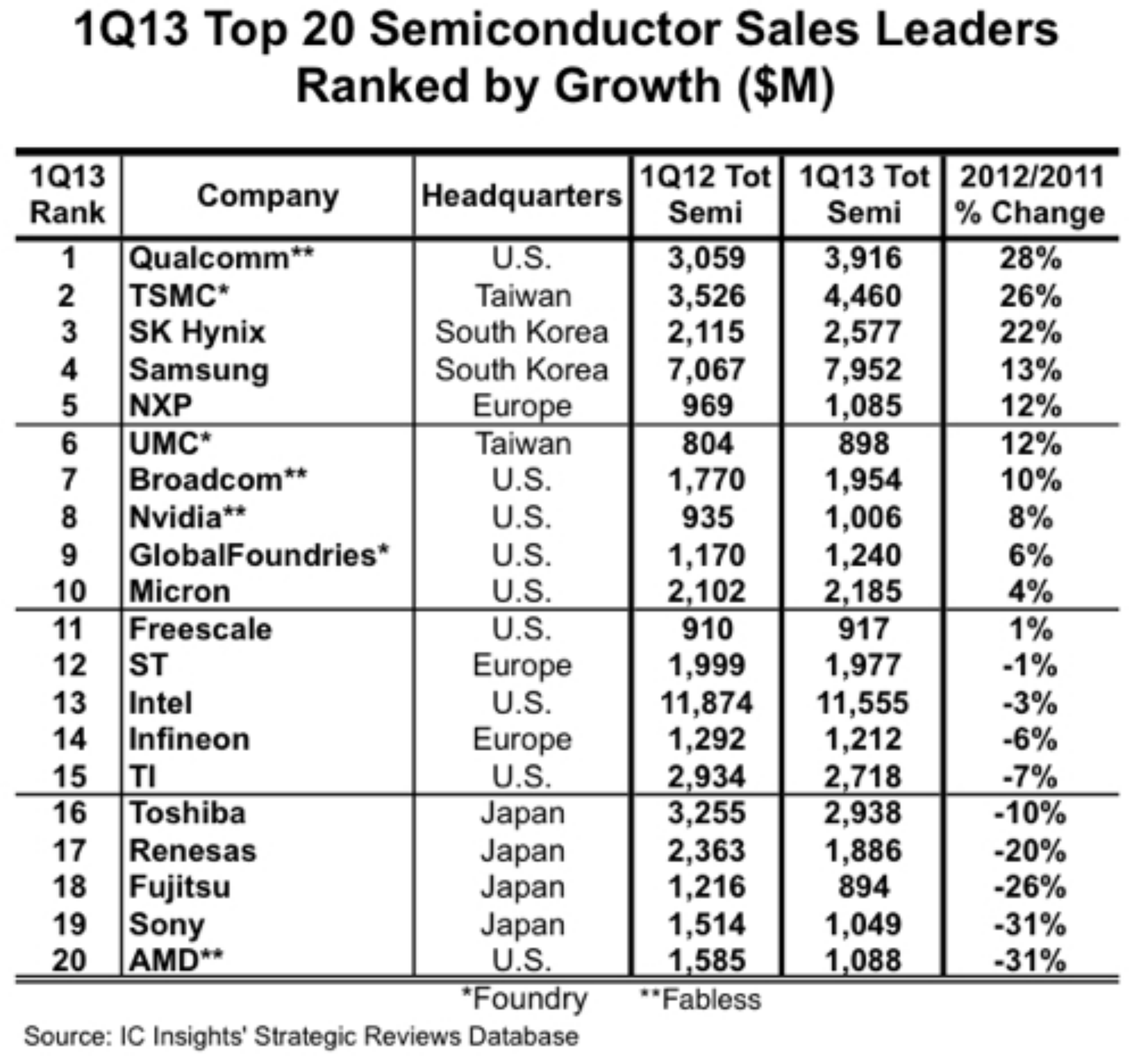
1Q13 Top 20 Semiconductor Sales Leaders ($M)

1Q13 Rank	1Q12 Rank	Company	Headquarters	1Q12 Tot Semi	1Q13 Tot Semi	2012/2011 % Change
1	1	Intel	U.S.	11,874	11,555	-3%
2	2	Samsung	South Korea	7,067	7,952	13%
3	3	TSMC*	Taiwan	3,526	4,460	26%
4	5	Qualcomm**	U.S.	3,059	3,916	28%
5	4	Toshiba	Japan	3,255	2,938	-10%
6	6	TI	U.S.	2,934	2,718	-7%
7	8	SK Hynix	South Korea	2,115	2,577	22%
8	9	Micron	U.S.	2,102	2,185	4%
9	10	ST	Europe	1,999	1,977	-1%
10	11	Broadcom**	U.S.	1,770	1,954	10%
11	7	Renesas	Japan	2,363	1,886	-20%
12	16	GlobalFoundries*	U.S.	1,170	1,240	6%
13	14	Infineon	Europe	1,292	1,212	-6%
14	12	AMD**	U.S.	1,585	1,088	-31%
15	17	NXP	Europe	969	1,085	12%
16	13	Sony	Japan	1,514	1,049	-31%
17	18	Nvidia**	U.S.	935	1,006	8%
18	19	Freescale	U.S.	910	917	1%
19	20	UMC*	Taiwan	804	898	12%
20	15	Fujitsu	Japan	1,216	894	-26%
Top 20 Total				52,459	53,507	2%

*Foundry **Fabless

Source: IC Insights' Strategic Reviews Database

Y/Y Sales Growth



1Q13 Top 20 Semiconductor Sales Leaders Ranked by Growth ($M)

1Q13 Rank	Company	Headquarters	1Q12 Tot Semi	1Q13 Tot Semi	2012/2011 % Change
1	Qualcomm**	U.S.	3,059	3,916	28%
2	TSMC*	Taiwan	3,526	4,460	26%
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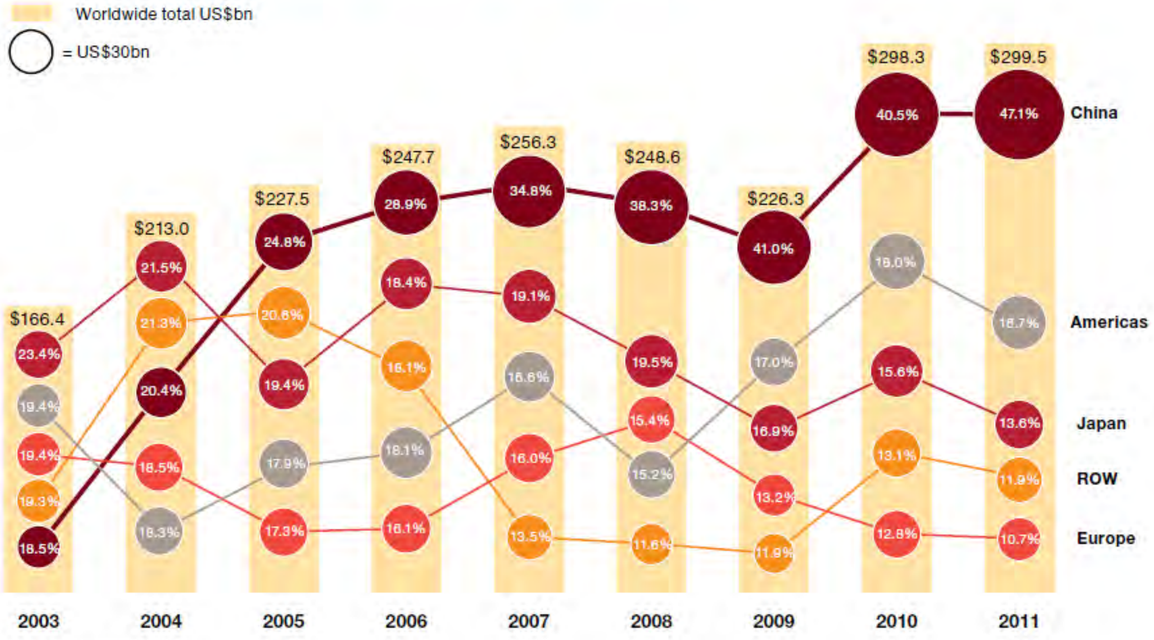
*Foundry **Fabless

Source: IC Insights' Strategic Reviews Database

Top Semi-Consumers

- China’s semiconductor consumption market grew by 14.6% in 2011 to reach a record 47% of the global market.
- China’s semiconductor market growth in 2011 was more than ten times greater than that of the total worldwide semiconductor industry.

Figure 1: Worldwide semiconductor market by region, 2003–2011
(Total worldwide in US$bn)

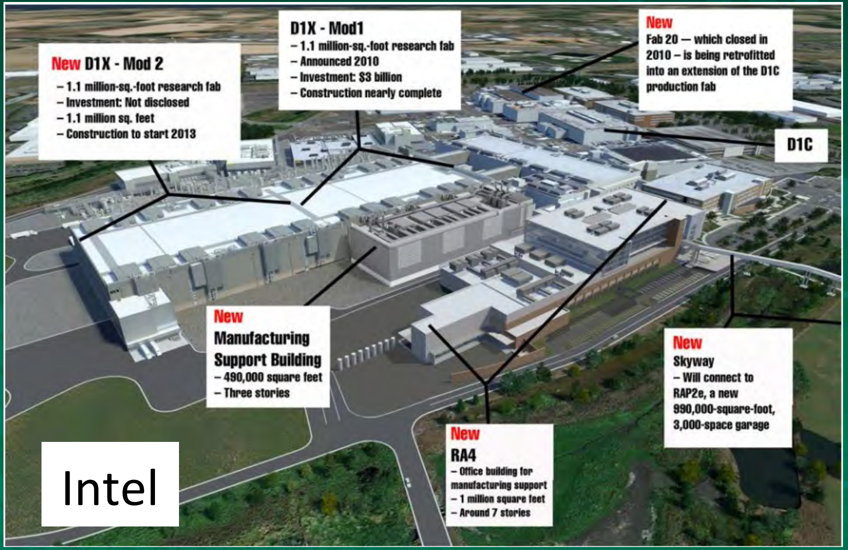


Source: SIA, MCR12, CCID

450mm has Arrived !

*Bob Bruck, Intel VP of Technology Manufacturing Engineering,
Unveiling the first fully patterned 450mm wafer on January 15, 2013,
at the SEMI Industry Strategy Symposium with Intel's Mario Abravanel.*

Birth of “Monster” FABs

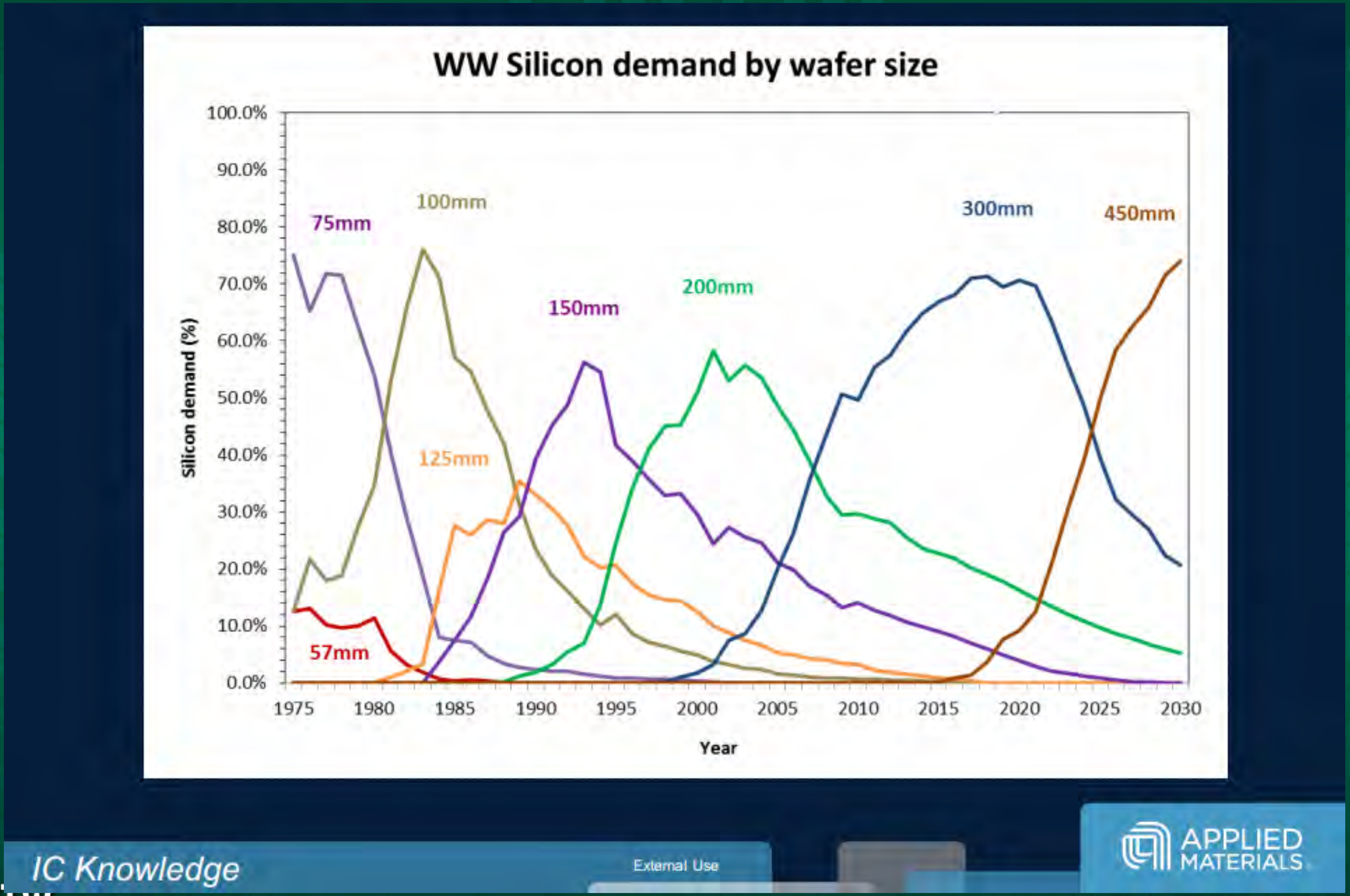


Intel

TSMC

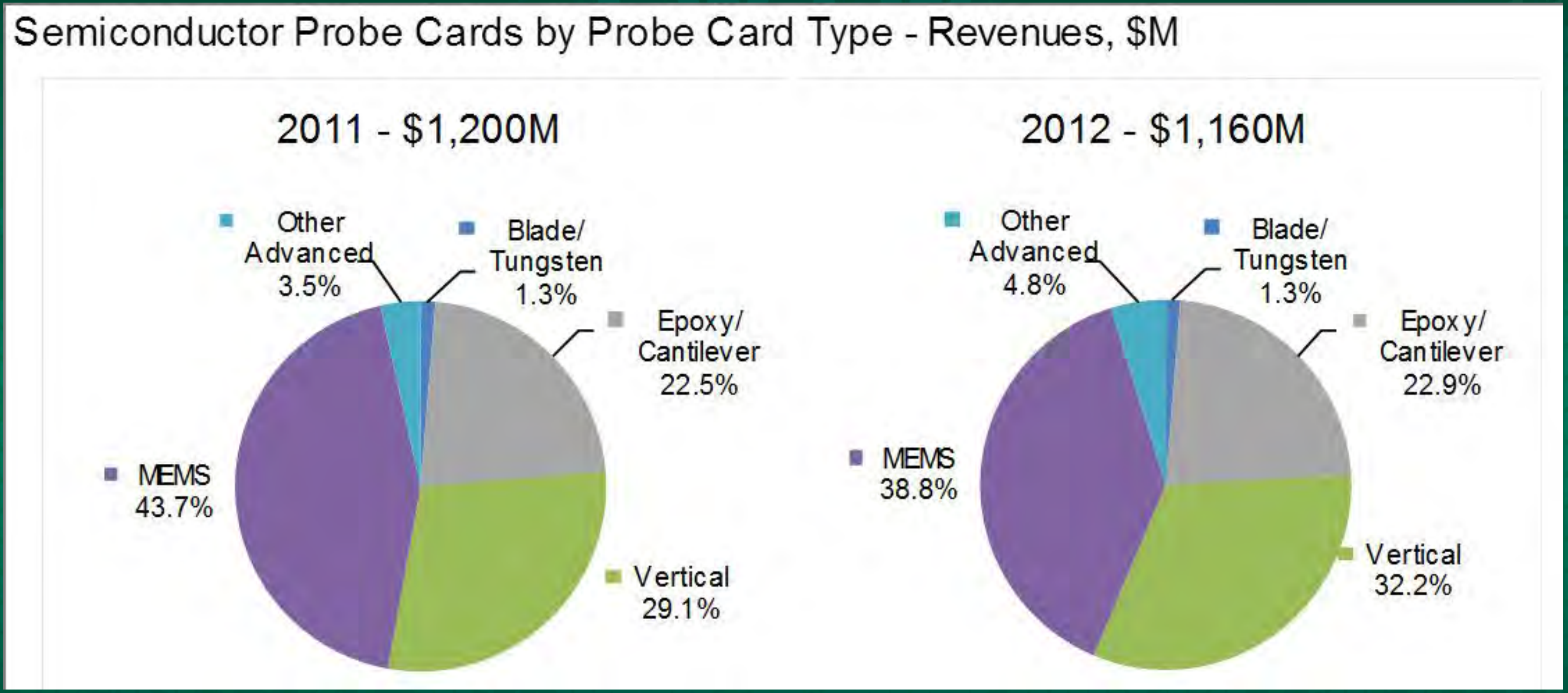
GlobalFoundries

Wafer Demand Trending



Semiconductor Probe Card Sales

Revenue by Technology



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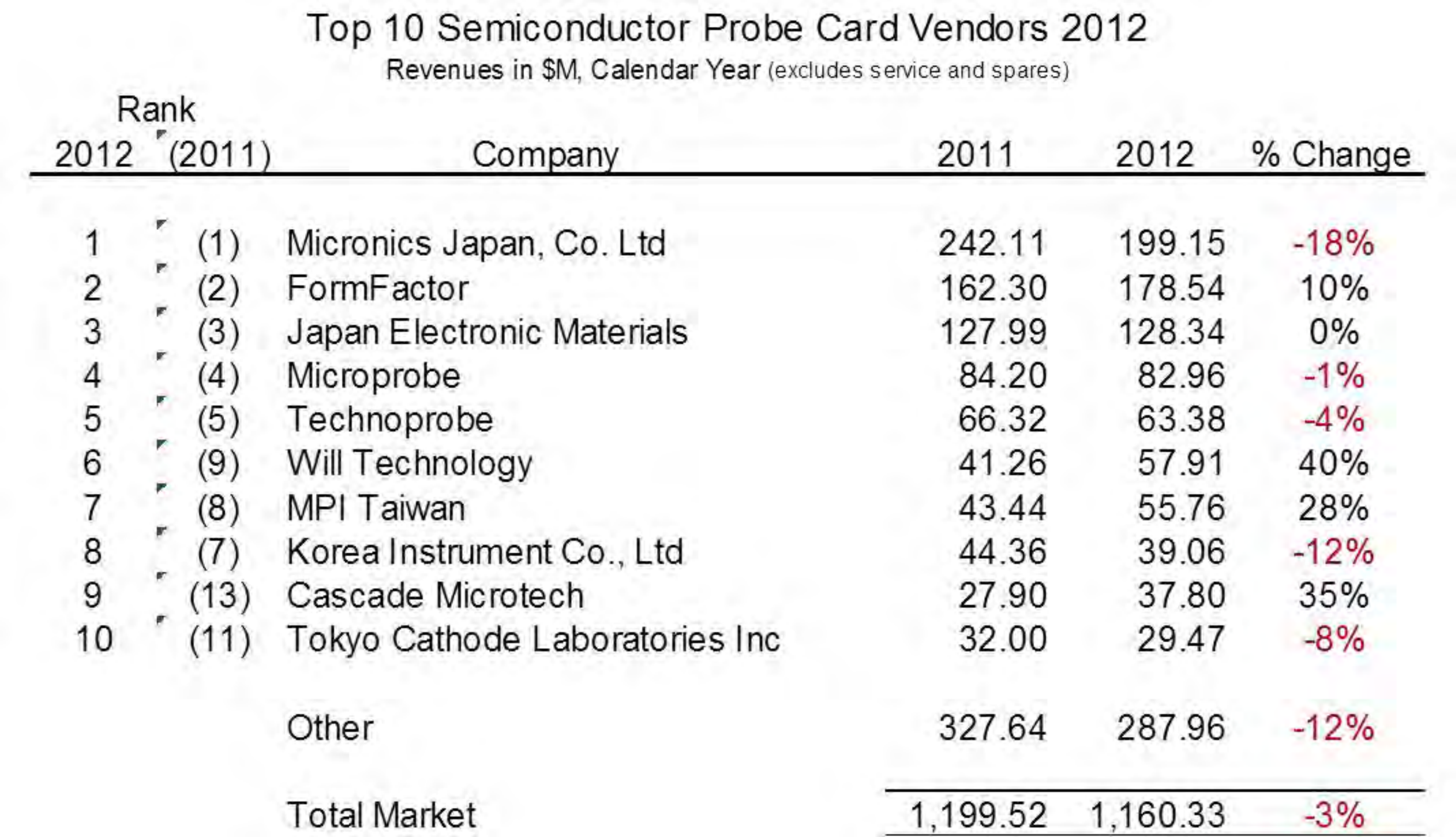
Thanks to John West and Risto Puhakka!

Top Probe Card Vendors



Top 10 Semiconductor Probe Card Vendors 2012

Revenues in $M, Calendar Year (excludes service and spares)

Rank 2012	(2011)	Company	2011	2012	% Change
1	(1)	Micronics Japan, Co. Ltd	242.11	199.15	-18%
2	(2)	FormFactor	162.30	178.54	10%
3	(3)	Japan Electronic Materials	127.99	128.34	0%
4	(4)	Microprobe	84.20	82.96	-1%
5	(5)	Technoprobe	66.32	63.38	-4%
6	(9)	Will Technology	41.26	57.91	40%
7	(8)	MPI Taiwan	43.44	55.76	28%
8	(7)	Korea Instrument Co., Ltd	44.36	39.06	-12%
9	(13)	Cascade Microtech	27.90	37.80	35%
10	(11)	Tokyo Cathode Laboratories Inc	32.00	29.47	-8%
		Other	327.64	287.96	-12%
		Total Market	1,199.52	1,160.33	-3%

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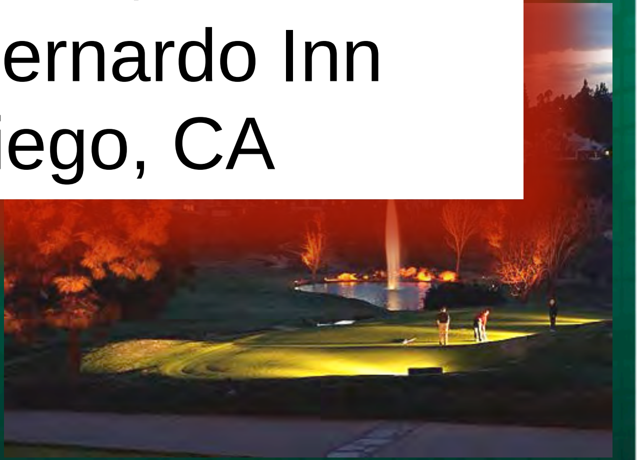
23st Annual SW Test Workshop

- **Technical Program for 2013**
  - Technical Tutorial on Sunday
  - Nine Focused Technical Sessions across three days
  - 31 Podium Presentations
- **Products / Services EXPO**
  - 42 full size booths … SOLD OUT !
  - EXPO does not compete with Technical Program
- **Corporate Support Program … MANY THANKS !**
  - Platinum: FormFactor, International Test Solutions, JEM - America, BucklingBeam
  - Gold : Advantest, R&D Circuits, Rudolph Technologies, Teradyne, MPI
  - Silver: Advanced Probing Systems, MultiTest, Microfabrica, SV Probe

Rancho Bernardo 2013



IEEE SW Test 2014
June 8 to 11, 2014
Rancho Bernardo Inn
San Diego, CA

Platinum Supporters

JEM

FORMFACTOR INC.

MICROPROBE

international

TEST SOLUTIONS

BucklingBeam

Gold Supporters

R&D CIRCUITS

TERADYNE

RUDOLPH™
TECHNOLOGIES

ADVANTEST®

MPI

Silver Supporters

ADVANCED PROBING SYSTEMS, INC.

multitest
A DOVER COMPANY

s v probe
An Ellipsiz Company

MICROFABRICA

SW Test 2013 Golf Scramble

- **Corporate Supporters, Exhibitors, and Attendees**

Only golf course in San Diego to have hosted both PGA, LPGA, and Collegiate events

William R. Mann Student Grant

William R. Mann
(1943 to 2010)
Founder of SW Test
Sr. Member IEEE

- **Miss Samantha Nhim** from University of Oregon, Eugene, OR was awarded the student grant for IEEE SW Test Workshop 2013.
- William R. Mann Student Grant supports student participation at IEEE conferences and encourages interaction between students and technologists.
- Grants are awarded to undergraduate or graduate students who will present a paper or participate at either the IEEE ITC or IEEE SW Test (one grant per conference per year).
- Student Grant is still available for IEEE ITC !

A few words about 2013 …

- **SW Test is IEEE sponsored and a 100% <u>non-profit</u> activity.**
- **SW Test is a workshop held on a "resort-style" property with a "food heavy" program designed to promote and encourage relaxed networking.**
- **Registration fee covers <u>ONLY the food and beverages</u> …**
  - Sunday reception and dinner
  - Daily breakfast, lunches
  - Daily AM and PM coffee breaks
  - EXPO reception, social function and dinner

- **All other costs are covered by Corporate Support and the Exhibitors at the EXPO !**
- **No other IEEE conference provides this type of focused, grassroots program.**

“We’re not in it for the money …”

- **Organization Team has worked closely with the RBI staff such that every attendee has free parking, in-room internet, no resort fees, and conference room rate.**

- **Organization and Technical Program …**
  - Jerry Broz, Ph.D., General Chair and IEEE Sr. Member
  - Rey Rincon, Freescale Semiconductor, Technical Program Chair
  - Maddie Harwood, CEM Inc., Finance Chair
  - Caroline Ambrose, CEM Inc., On-site EXPO / Registration Coordinator
  - Meredith Griffith, CEM Inc., EXPO / Registration Coordinator

“Who’s Really to Blame …”

- **Program Committee …**
  - Darren James (Rudolph Technologies)
  - Jan Martens (NXP Semiconductor)
  - Patrick Mui (JEM America)
  - John Caldwell (Micron Technology)
- **Steering Committee …**
  - Gunther Boehm (FeinMetall GmbH)
  - Michael Huebner, Ph.D. (FormFactor)
  - Tatsuo Inoue (MJC)
  - Amy Leong (Formfactor)
  - Clark Liu (PTI)
  - Mark Ojeda (Spansion)
  - Fred Taber (BiTS Workshop)
  - Joey Wu (MPI)

IEEE SW Test is organized, coordinated, and executed through the volunteer efforts of your colleagues.

Technical Program / Agenda

- **Sunday, June 9**
  - Tutorial Sessions
    - *Use of Resource Sharing Techniques to Increase Parallel Test and Test Coverage in Wafer Test*
      - Michael Huebner, Ph.D. (FormFactor)
    - *Methods of analyzing/predicting scrub margin for pads and bump applications*
      - Tom Watson and Amy Leong (FormFactor)
  - Registration and Cocktails
  - Buffet Dinner and Keynote Presentation

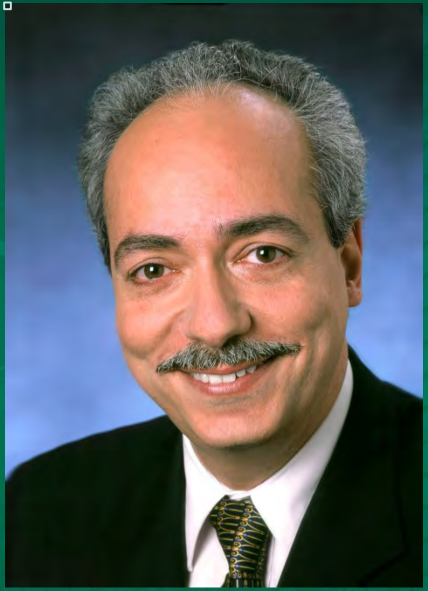
Keynote Presentation

- **Sunday, June 9**

Yervant Zorian, Ph.D.

Fellow & Chief Architect

SYNOPSYS®



Test and Reliability Challenges in Advanced Semiconductor Geometries

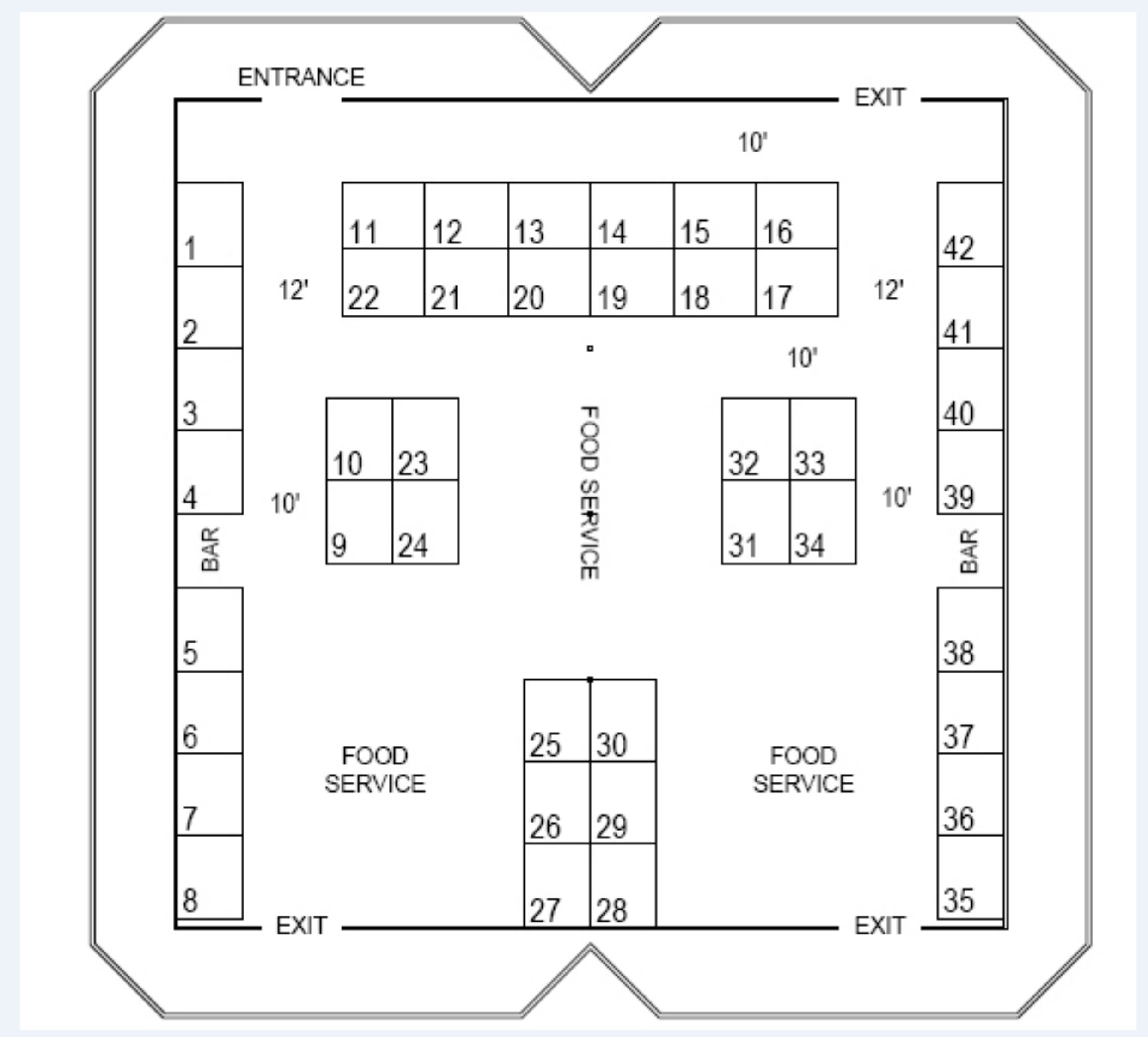
Technical Program / Agenda

- **Monday, June 10**
  - – Registration and Breakfast
  - – Fine Pitch Bump and Pillar Probing
  - – Industry Trends and Advanced Packaging Challenges
    - Lunch (Aragon Lawn)
  - – Productivity & Accuracy Challenges in Probing
  - – Probe Card Design and Repair
  - – EXPO 2013 w/ Dinner at Reception Stations
    - Networking at La-Taberna Bar

IEEE SW Test EXPO 2013

- Accretech America Inc
- AEHR TEST SYSTEMS
- BE Precision Technology
- BucklingBeam … PLATINUM
- Cascade Microtech, Inc.
- Complete Probe Solutions Inc.
- ERS America
- Feinmetall GmbH
- FormFactor / MicroProbe Inc. … PLATINUM
- High Speed Interconnects
- Hitachi Chemical Co. America, Ltd.
- HTT High Tech Trade GmbH
- Innovative Manufacturing Technology
- Integrated Technology Corporation
- Integrated Test Corporation
- International Test Solutions, Inc. … PLATINUM
- IWIN Co.,Ltd.
- JEM America Corp. … PLATINUM
- Johnstech International
- Kanemtasu USA Inc.
- Kita USA, Inc.
- LEENO
- MarTek Inc
- Micronics Japan Co., LTD.
- MultiTest … SILVER
- Nomura Plating Co., Ltd.
- Oxford Lasers
- Plastronics Sockets & Connectors
- Pozzetta Products
- ProbeAce Co.,Ltd.
- prober.com
- R&D Circuits … GOLD
- Rika Denshi America Inc.
- Smiths Connectors - IDI
- Specialty Coating Systems
- STAr Technologies, Inc.
- SV Probe - An Ellipsiz Company … SILVER
- T.I.P.S. Messtechnik GmbH
- Technoprobe America
- Tokyo Electron Limited (TEL)
- Vermont Microdrilling
- Wentworth Laboratories, Inc.

IEEE SW Test EXPO 2013



QR Code on Badges

- **QR codes on the backside of the badges**
  - First and Last Name
  - Organization
  - Email Address
- **Suggested Free Readers**
  - QRReader (TapMedia)
  - ScanLife (Scanbuy)
  - Many more free Apps are available
- **Download App and Test before entering the EXPO**

Technical Program / Agenda

- **Tuesday, June 10**
  - – Registration and Continental Breakfast
  - – Power Delivery Challenges
  - – Taking Probing Into New Directions
    - Lunch (Aragon Lawn)
  - – High Performance Probing in Volume Production
  - – EXPO 2013 w/ Refreshments will be served
  - – San Diego Heritage at RBI Santiago Courtyard

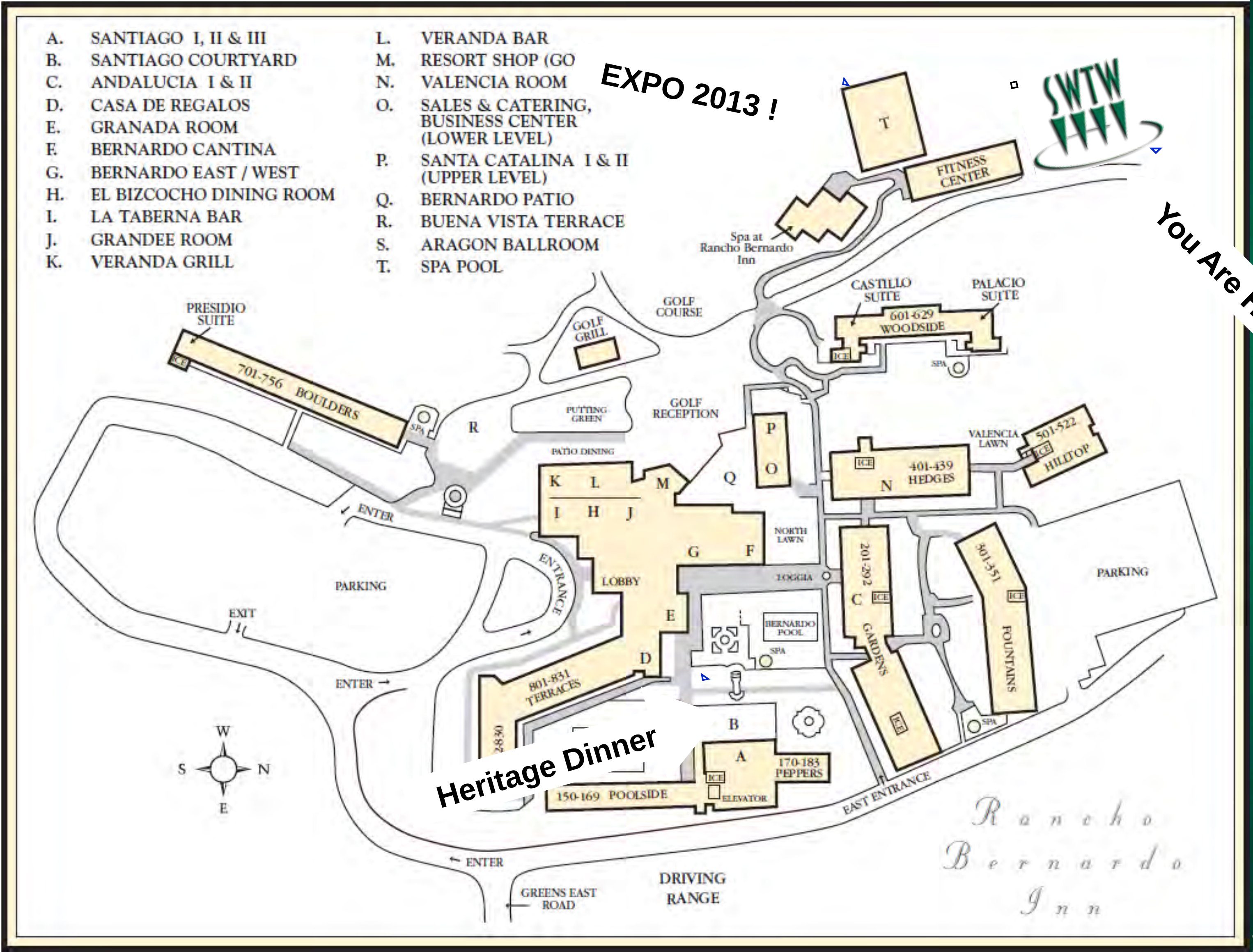
Tuesday Social Celebrates San Diego Heritage at RBI

- Celebrate the Spanish History of San Diego
- Mariachi performers during dinner
- Buffet Dinner and Relaxed Networking
- Flamenco Dancer Performance
- Kids UNDER 12 can join for free !

Technical Program / Agenda

- **Wednesday, June 12**
  - Registration
  - Probe Potpourri
  - Challenges of High Frequency Test
  - Awards and Adjournment
  - Box Lunch (Aragon Lawn)

Map of the Area



A.	SANTIAGO I, II & III
B.	SANTIAGO COURTYARD
C.	ANDALUCIA I & II
D.	CASA DE REGALOS
E.	GRANADA ROOM
F.	BERNARDO CANTINA
G.	BERNARDO EAST / WEST
H.	EL BIZCOCHO DINING ROOM
I.	LA TABERNA BAR
J.	GRANDEE ROOM
K.	VERANDA GRILL
L.	VERANDA BAR
M.	RESORT SHOP (GO
N.	VALENCIA ROOM
O.	SALES & CATERING, BUSINESS CENTER (LOWER LEVEL)
P.	SANTA CATALINA I & II (UPPER LEVEL)
Q.	BERNARDO PATIO
R.	BUENA VISTA TERRACE
S.	ARAGON BALLROOM
T.	SPA POOL

Recognition & Awards

- Best Overall Presentation
- Best Data Presented
- Most "Inspirational" Presentation
- Best Presentation, Tutorial in Nature
- William R. Mann Student Grant

- Some other "Special Awards"

2012 William R. Mann Student Grant

- Mr. Soheil Khavandi from University of Nevada, Reno was awarded the student grant for IEEE SW Test Workshop 2012.

SWTW-2012 Awards

Most Inspirational Presentation

"An Analysis of Probing CRES in Gold Bumping Pad using Automatic Test Equipment"

Chang Hyun
Samsung Semiconductor Institute of Technology
Hyun-Ho Park and Sik-Sang Hahm
Samsung - Korea

Best Presentation, Tutorial in Nature

"Crossover in TD efficiency - When the Brick Wall is Not the Best"

Keith Breinlinger, Ph.D.
FormFactor, Inc.

SWTW-2012 Awards

Best Data Presentation

"Wafer Probe Challenges for the Automotive Market"

Luc Van Cauwenberghe
Frank De Ruyck
Wim Dobbelaere
ON Semi - Belgium
Riccardo Liberini
Marco Di Egidio
Riccardo Vettori
Technoprobe SPA

"Case Study: Integrating a 300mm Probing Solution with a Diagnostic Emission Microscopy"

Richard Portune
Kevin Eseltine
DCG Systems, Inc.

Best Overall Presentation

"Full Wafer Contact Breakthrough with Ultra-High Pin Count"

Daisuke Takano and Takashi Naito
Advantest - Japan
Tsutomu Shoji
Japan Electronic Materials, Corp. - Japan

That "Special" Award …

Bill Mann's Poorest Disguised Sales Pitch

"What happens at SW Test stays at SW Test !!"

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Want to Learn More ?

- **Electronic Components and Technology Conference**

  2013 held in Las Vegas, NV, on 25-May to 02-June
  2014 held in Lake Buena Vista, FL, on 27 to 30-May

  http://www.ectc.net

- **Burn In & Test Strategies Workshop**

  Mesa, Arizona
  http://www.bitsworkshop.org

- **IS-Test Workshop**

  Freising, Germany
  http://www.is-test.com

Silence your cell phone !!!

Thanks for your Support !

- Contact the SW Test Team with any questions …

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