

SCANFAX

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A publication of the
Institute of Electrical & Electronics Engineers
— Chicago Section —

Machines That Make Machines

Automation in the
production of
semiconductors
and devices

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CHICAGO SECTION EXECUTIVE COMMITTEE MEETING

Tuesday, February 10, 2004, 7:00 p.m.

DeVry DuPage, Room TBA, 1221 N. Swift Rd., Addison, IL

No Registration Needed

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Machines That Make Machines

Automation in the Production of Semiconductors and Devices

By Paul Zukowski

Among the many industrial applications of electronics, one of the most highly automated is the production of the semiconductor chips that power the industrial strength PCs that make the whole process work. From growing pure crystals of silicon to slicing off wafers, imprinting and depositing circuits and assembly of the end devices, automation plays a key role in coordinating and improving efficiency in the multi-billion-dollar fabrication plants.

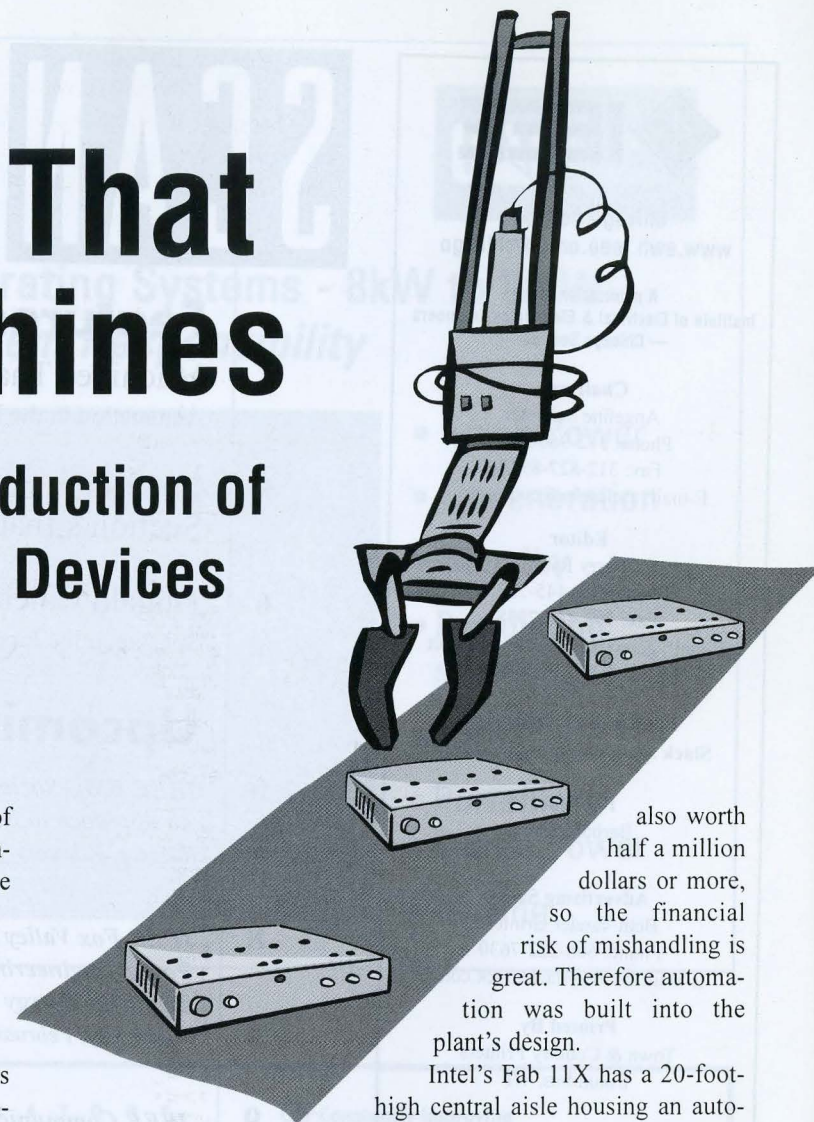
The demands of the 24x7 "fabs" that produce semiconductors bring forth innovations that periodically jump beyond older technologies. This has been especially true recently as the shift from 200-mm to 300-mm silicon wafers works its way through the industry, creating new opportunities to boost the industry's use of automation.

Semiconductor manufacturing plants are gigantic rooms full of steppers, etchers, implanters and other complex manufacturing tools. Over time, the workers wearing masks and protective garments that push carts of partially completed silicon wafers from one processing station to the next are being replaced by advanced robots that shepherd silicon wafers in and out of the process chambers where microscopic transistors and other circuits are created in as many as 400 different steps.

In some cases, existing 200-mm wafer fabs are being retrofitted with additional automation. But most of the latest automation technology is aimed at the new generation of fabs built to handle the larger 300-mm wafers.

A case in point is Intel Corp.'s Fab 11X in Rio Rancho, New Mexico. The new \$2-billion chip factory is Intel's first 300-mm full production facility and its most automated chip factory, making Pentium 4 microprocessors and other advanced chips with circuits as narrow as 0.13 microns, according to an article in *Electronic Business*.

Bruce Sohn, Manager of Fab 11x, is quoted as saying, "Automation and 300-mm [technology] go hand and hand." Sohn pointed out that fully loaded containers of pizza-size 300-mm wafers weigh about 20 pounds each – too heavy for human operators to lift repeatedly and carry around the fab. Each container-load of 25 wafers is



also worth half a million dollars or more, so the financial risk of mishandling is great. Therefore automation was built into the plant's design.

Intel's Fab 11X has a 20-foot-high central aisle housing an automated two-level monorail that will carry containers of wafers from one group of processing machines to the next. Numerous vertical "stocker" cabinets temporarily store containers of wafers until they are ready for the next production step. Fanning out on both sides of that aisle are bays of production tools linked by a series of 12-foot-high overhead hoists that will move wafers to and from the central monorail to the individual processing stations.

Someday semiconductor factories may reach the "lights-out fab" goal where no human workers are required. Fab 11X takes a step in that direction, changing the proportion of workers handling production tasks from 60% to 40%.

Another change in the conversion to 300-mm technology is that the industry agreed on a set of standards for making production and automation equipment more interoperable. One 300-mm standard specifies a new type of container for transporting wafers and reticles, the stencils used to create circuit patterns on chips. The new protective wafer carrier is called a front-opening unified pod (FOUP), and chip-making equipment needs to be able to handle them.

These new standards have encouraged companies like Brooks Automation Inc. to expand beyond its original business of building robots that operate in the vacuum conditions inside clusters of chip-making equipment. Brooks acquired the Infab division of Jenoptik AG, Jena, Germany, which had developed key technology for opening FOUP doors, and Irvine Optical Co. of Burbank, Calif., a leading

maker of wafer handling and inspection equipment. Brooks' robots, software and related tool-automation components are also incorporated into the products of original equipment manufacturers (OEMs) like Lam Research Corp., Fremont, Calif., and Novellus Systems Inc., San Jose, Calif.

Brooks also made acquisitions in the software area, and market researcher VLSI Research Inc. estimates that Brooks is now the leading supplier of semiconductor automation software.

Another sector of the market undergoing change is automated material handling system (AMHS) technology. AMHS systems

that include conveyors, hoists and other technology for moving wafers around the fab represent one of the biggest automation markets with nearly \$500 million in annual sales, according to *Electronic Business*.

Japanese AMHS vendors such as Murata Machinery Ltd., Kyoto, Shinko Electric Co. Ltd., Tokyo, and Daifuku Co. Ltd., Osaka, are thought to dominate the first 300-mm fab installations. However, Fremont, Calif.-based Asyst Technologies Inc. is also reported to have made inroads with its FasTrack materials-handling system that transports FOUPs with conveyor belts and wheels instead of overhead tracks and hoists. Sup-

posedly FasTrack moves wafers two to three times faster than older AMHS technologies.

While some analysts see the semiconductor automation industry maturing to a point where a handful of companies dominate, one company would probably never get all the business since companies would not want to commit such a crucial technology to a single supplier. The industry's new standards also make it easier for specialized suppliers to develop "plug and play" tools. This opens up numerous possibilities for innovation to meet the evolving needs of semiconductor manufacturing. ■

Reenactment of the IEEE Chicago Section's Inaugural Meeting

Downers Grove, Illinois (January 5, 2004). Take a journey into history when the Institute of Electrical and Electronic Engineers (IEEE) Chicago Section and the Illinois Institute of Technology (IIT) celebrate their rich history when honoring the 110th anniversary of the section's inaugural meeting on March 23, 2004 at IIT's new McCormick Tribune Campus Center.

This meeting will be a reenactment of the inaugural meeting held on March 21, 1894 in Professor Wilbur Stine's lecture room at the Armour Institute—precursor to IIT. This meeting, attended by 45 members and guests, was held simultaneously with a regular meeting held at the New York headquarters of the American Institute of Electrical Engineers (AIEE)—precursor to IEEE. Twenty-one "western engineers" sent a petition to New York requesting that a local meeting of AIEE members be held in Chicago. The Chicago Section has the distinction of being the first section formed outside of AIEE headquarters. The use of long distance telephone lines between Chicago and New York allowed the holding of a joint meeting so members could exchange their views on the meeting topic while extending greetings to their electrical colleagues.

The topic of the meeting was a reading of the paper by Professor William A. Anthony of Cornell University entitled "On the Effect of Heavy Gases in the Chamber of an Incandescent Lamp." This same paper was read in Chicago by Professor Dugald C. Jackson of the University of Wisconsin.

A lengthy discussion followed the readings in both New York and Chicago since there was no uniform agreement on why carbon filament incandescent lamps darkened after moderate use. The paper discussed the new Novak lamp that was introduced at the World's Columbian Exposition the year before, claiming no reduction in candle power over the life of the lamp.

The New York group sent congratulations to the attendees at the Chicago meeting, and they "trusted that the intercommunication, for the first time, inaugurated by means of the telephone would not be the last." The group believed that considerable advance would be made in the electrical science by the idea of holding simultaneous meetings in different parts of the country. It was all agreed that the first Chicago meeting was a grand success and future meetings should be held. This meeting spawned the Chicago Section, which continues today serving the interests of electrical engineers in the Chicago area.

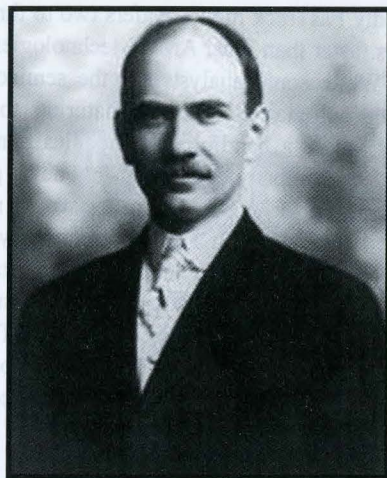
The ability to hold a local meeting of the Chicago AIEE members is partly owed to the great success of the World's Columbian Exposition in Chicago in 1893, showcasing the developments in electrical engineering to the world. The distribution and use of electrical power was evident at the Fair, providing illumination of the grounds, buildings, waterways and the sky search-lights all challenging the need for natural gas. Electricity was used to power all aspects of the Fair including the elevated railways, making a huge impression on all who attended and even the City of

Chicago was being recognized as an ideal model city.

Plans for the reenactment of the meeting include a dinner to be given in the ballroom of the new McCormick Tribune Campus center. This ballroom, which can accommodate 150 persons, would represent the 21st century room. Attendees will be welcomed by an IIT dignitary who will explain the recent expansion of the campus. The Chicago Section will present a gift to IIT in honor of their continual support of electrical engineering education in the Chicago area. The attendees will then be led to Professor Stine's lecture room (adjacent auditorium) that would represent the 19th century room where excerpts of the Anthony paper will be read aided by 21st century visual aids. A reenactment of some of the more interesting challenges to the paper will be given by members of the Chicago Section playing the parts of the 19th century participants. The Chicago Section will invite participation by the IIT student chapter which is celebrating its 100th anniversary.

The meeting will also include the same greeting given by then AIEE President Houston, to the "western AIEE members." The first members of what is now known as the Chicago Section Executive Committee will be introduced.

After the meeting, attendees may visit the campus center at their leisure, visit the bookstore and purchase refreshments in the new Bog. This special meeting is sponsored by the Chicago Section Executive Committee. ■



Dugald Caleb Jackson

Speaker at the First Chicago Section Meeting

ate study in electrical engineering at Cornell College, to become an instructor in physics in 1887. That is probably when he met Professor Anthony.

Between 1889 and 1890, he served two roles: Vice President and Engineer for the Western Engineering Company at Lincoln, Nebraska. Jackson designed and constructed electric light and power plants, and distribution systems in that part of the United States. He later became an Assistant Chief Engineer with the Sprague Electric Railway and Motor Company, at New York, and Chief Engineer of the central district of what was referred to as the Edison General Electric Company in 1891.

That same year, Jackson turned to the educational arena as a Professor of Electrical Engineering at the University of Wisconsin. He taught his students for 16 years, developing the department of electrical engineering until 1907, where he was now Professor and head of Electrical

Engineering at the Massachusetts Institute of Technology.

The beginning of World War I sent Jackson overseas as Lieutenant-Colonel of Engineers. In 1929 he was U.S. Government delegate to the World Engineering Congress and in later years, he served on many technical societies, including the Society for Promotion of Engineering Education.

Jackson authored many technical papers and was the inventor of various electrical devices, for which he held patents in the fields of electric rotating machinery and transformers, telephone equipment and train lighting. But he is most remembered for his success in engineering education. In 1938 the AIEE presented him the Edison Medal, "For outstanding and inspiring leadership in engineering education and in the field of generation and distribution of electric power."

Dugald died July 1st, 1951.

Reference: *IEEE Legacies*

SPECIAL CHICAGO SECTION EVENT

INAUGURAL MEETING REENACTMENT

Be a part of history – join us in celebrating the 110th anniversary of the IEEE Chicago Section's inaugural meeting originally held at the Armour Institute on March 21, 1894. The Chicago Section has the distinction of being the first section formed outside AIEE headquarters.

Socialize while exploring the new Ron Koolhaas designed McCormick Tribune Campus Center as commuter trains whiz overhead in the distinctive 530 foot-long stainless steel clad tube. Dine on the 21st century dinner in the conference center ballroom before a presentation is made to IIT in recognition of their contributions to the electrical and computer engineering profession. Transport yourself to the simulated lecture hall of Professor Stine of the Armour Institute to experience, through reenactment, the inaugural meeting.

A special meeting is hereby requested of the Institute by the required 20 petition signers to hold a local meeting in Chicago. Through the kind offer of Professor Stine of the Armour Institute, this meeting will be held in Professor Stine's lecture room at the Armour Institute. The paper to be presented will be "On the Effects of Heavy Gases in the Chamber of the Incandescent Lamp" by William A. Anthony. In the author's absence the paper will be presented by Professor Dugald C. Jackson of the University of Wisconsin.

- Honorary Secretary Edward Caldwell, 1894

Learn the marvels of the Novak Lamp, recently introduced at the World's Columbian Exposition, claimed as the only incandescent lamp that retains to its last its original candle power. Will this lamp survive Edison patent claims?

PROGRAM

- 5:30 p.m. Socialize at the new McCormick Tribune Campus Center
- 6:15 p.m. 21st century dinner at Conference Center Ballroom
- 7:15 p.m. Welcome address and presentation to IIT
- 8:00 p.m. Inaugural meeting reenactment in Conference Center Auditorium
- 9:00 p.m. Adjourn

March 23, 2004

Illinois Institute of Technology
McCormick Tribune Campus Center
33rd and State Streets, Chicago, Illinois



IEEE

Attire: 19th, 21st century business, Armour Institute, Lewis Institute or IIT student attire.

www.ewh.ieee.org/r4/chicago

Cost of presentation and dinner is \$50.00. Make reservations with IEEE Chicago Section business office at 1-312-253-IEEE. Sponsored by IEEE Chicago Section Executive Committee.



EVENING MEETING

IEEE EMC Society Chicago Chapter

An Approach to Board Level Suppression

Tuesday, February 10, 2004

Roger Swanberg, D.L.S. Electronic Systems, Inc.

About the Topic:

This talk covers the setup and operation of a low cost suppression site. It shows an approach to setting up and using a site for identifying and suppressing EMI signals from small electronic devices or systems. These emissions can be identified by means of a systematic, organized approach down to the device and pin level where suppression techniques can then be applied.

About the Speaker:

Roger Swanberg is a NARTE Certified and EMC Engineer Senior EMC Engineer working at D.L.S. Electronic Systems, Inc. He is a Graduate of the Illinois Institute of Technology in Chicago and has held various positions in the

Electronic Engineering field for over 40 years.

As EMC and Electronics Design Engineer, Roger worked for Motorola Consumer Products and Zenith Radio in Color TV design, Nuvatec Design Consulting as EMC Designer and Manager of EMI Testing Services, USRobotics as Regulatory Compliance and Engineering Support Manager, Motorola Lighting and Motorola Cellular as EMC and Electronics Designer.

He is presently Vice-Chair for the IEEE EMC Society and Secretary for the IEEE 2005 Symposium in Chicago.

Location:

DLS Electronic Systems
1250 Peterson Drive
Wheeling, IL 60090

Time:

6:30 PM Social Hour
7:00 PM Meeting Start

Reservation:

Jack Black
DLS Electronic Systems
847-537-6400

Additional Information:

www.ewh.ieee.org/soc/emcs/chicago/

EVENING MEETING

IEEE Fox Valley Subsection, Chicago Chapter of the Power Engineering Society, and ITT-Rice Campus The IEEE Energy Policy Committee in Action Wednesday, February 18, 2004

Fernando L. Alvarado, Professor Emeritus, University of Wisconsin

About the Topic:

Fernando will give an overview of the IEEE Energy Policy Committee in action. He will focus on the mandate of the committee and on an overview of recent actions and positions taken. His perspective is one that effective engineering policy positions and recommendations need to be supported by sound technical, economic and political underpinnings, and he will discuss how the interplay between these needs sheds an entirely new light on purely technical issues. He will then discuss in some detail the specifics of some of the actions the committee recently took in connection with providing legislative support to the recent blackout as an example of the kind of capabilities of the committee. He will then discuss future directions that the committee is expected to undertake, and invite participation by the audience with comments and suggestions for action.

About the Speaker:

Fernando L. Alvarado is a Professor Emeritus of Electrical and Computer Engineering at the University of Wisconsin and a Senior Consultant at Christensen Associates. He earned a Ph.D. in Electrical and Computer Engineering

from the University of Michigan in 1972, a Masters from Clarkson University in 1969 and a PE and BEE degree from the National University of Engineering in Lima, Peru. He is a fellow of IEEE.

He is the Vice-Chairman of the IEEE Energy Policy Committee. He has served as a member on a panel of experts for the study of a National Interest Transmission Grid for the US, reporting results to the Secretary of Energy in December 2001.

He participated in a Presidential Task Force on Critical Infrastructures during 1997 and 1998. He has hundreds of journal publications, articles, book chapters, reports and conference presentations. He is recognized for his work on the integration of economics and electric power networks. He has developed methods for efficient trading in power networks, including a method for hedging against price uncertainty (with R. Rajaraman). He has done extensive work for CIGRE on the topic of ancillary services. He is a well-known software expert, with emphasis on large scale computation, sparse matrices and least squares methods and co-author of several software packages.

Location:

IIT's Rice Campus, 201 East Loop Road, Wheaton, Illinois. Take Rt.56/Butterfield Rd. to first stoplight east of intersection of Butterfield & Naperville roads. Turn north onto East Loop Road (Grady's Restaurant and Phillip's 66 Gas Station on the corners); the campus will be on your right about a block north of Butterfield Road. More detailed directions and a map are available at <http://www.rice.iit.edu/directions.html>.

Sponsorship:

IEEE's Fox Valley Subsection, Chicago Chapter of the Power Engineering Society, and Illinois Institute of Technology's Center for Professional Development (Rice Campus).

Time:

6:00 PM Networking Time
7:00 PM Presentation

Reservations:

Reservations are not required.

The Fox Valley subsection web page is at www.ieee.org/foxvalley/

Upcoming Events!

Computer & Network Security Workshop & Expo

Thursday, February 26, 2004

8:30 AM-9:00 AM – Registration/Networking
9:00 AM-5:00 PM – Security Workshop & Expo
5:00 PM-6:00 PM – Reception/Social Hour
6:00 PM-9:00 PM – Engineers Week Speaker's Forum

Sponsorship: IEEE's Fox Valley Subsection and Illinois Institute of Technology's Center for Professional Development (Rice Campus)

About the topic: Illinois Institute of Technology's Center for Professional Development (IIT/CPD) and the Institute of Electrical and Electronic Engineers (IEEE) are sponsoring a one-day Security Workshop and Expo at IIT's Rice campus in Wheaton Illinois.

This workshop will bring together knowledgeable security practitioners and responsible executives from organizations such as security providers and manufacturers, scientific laboratories, law enforcement, medicine, and legal organizations to discuss and share their security needs, problems, technologies, security systems, plans and much more.

Location: IIT's Rice Campus, 201 East Loop Road, Wheaton, IL

Directions: Are available at <http://www.rice.iit.edu/directions.html>.

Cost: \$35 (\$20 for students) includes registration, materials, Continental breakfast and lunch.

Reservation: Advance registration is required. Space is limited, contact Janet Reif, Manger of Professional Learning, at (630) 682-6035 or reif@iit.edu. Reservations and payment is due by Tuesday, February 17, 2004.

For more information: For additional details, please visit www.cpd.iit.edu/securityworkshop.html or contact Janet Reif at (630) 682-6035 or reif@iit.edu.

EVENING MEETING

IEEE Communication/Computer Society Chicago Chapter (Joint with IEEE Fox Valley Subsection) The Birth of the Multi-Billion Dollar Market for Standards Telecom Platforms Wednesday, February 25, 2004

Charles Byers, Bell Labs Fellow

About Topic:

The design process for network equipment is changing. Proprietary, single use systems — common in legacy equipment — are growing unacceptable. Now, platform approaches based upon open industry standards are gaining momentum. The standards based modular platform approach can have many development, cost, schedule, and feature richness advantages compared to proprietary systems.

This talk will discuss the general value of moving from proprietary designs to open standards. We will discuss the network architecture and cost implications standard modular platforms. There will be a brief survey of the most applicable hardware and software standards.

It will then go into a detailed discussion of one of the most important industry standards in the telecom/datacom/server space, the Advanced Telecommunications Computing Architecture (PICMG 3). This new standard covers a shelf level system optimized for telecommunications, data networking, and data server applications. It will discuss the history of the standard, its technical details, how it is applied to the design of network elements, and its market potential (which one analyst puts at \$3.7B by 2007).

Finally, case studies of platform-based designs from several industries will be explored.

About the Speaker:

Charles C. Byers is a Consulting Member of Technical Staff and Bell Labs Fellow in Lucent's Supply Chain Networks organization in Naperville, Illinois. During his 18 year career with Bell Labs, he has been involved in electronic design at the chip, circuit board, and system level, as well as network architecture and marketing. He is currently working on the architecture and implementation of advanced broadband networks and platforms. He is also a leader in the Advanced Telecom Compute Architecture (AdvancedTCA/PICMG3) standards body.

Mr. Byers received his B.S. in Electrical and Computer Engineering and a M.S. in Electrical Engineering from the University of Wisconsin, Madison. He holds 20 US patents.

Location:

IIT Rice Campus, Room 166.

Directions:

The IIT Rice campus is on the northeast corner of the junction of East Loop Road at Butterfield

Rd. The intersection is about 3 miles west of IL 355 and IL 53.

Map: <http://www.rice.iit.edu/directions.html>

Time:

6:30 PM Social (Free snack and beverages),
7:00 PM Presentation

Sponsorship:

IEEE Communication Society Chicago Chapter, Computer Society Chicago Chapter and IEEE Fox Valley Subsection.

Cost:

There is no charge for attending the seminar.

Reservation:

Reservations are not required, but registering your intent of attendance at ieechi@yahoo.com is very appreciated.

For More Information:

Visit IEEE Chicago Section website at: <http://www.ewh.ieee.org/r4/chicago/>, or contact: Yigang Cai - ycai@ieee.org; Jack Sherman - j.sherman@ieee.org; Jerry Kattke - g.kattke@ieee.org; Joe Weesner - joe.weesner@ieee.org.

Upcoming Events!

DuPage Area Engineers Week 2004: Engineering Anniversaries

Join Us in Celebrating our 20th Anniversary

Thursday, February 26, 2004

6:00 PM - 9:00 PM –

Speaker's Forum

Saturday, February 28, 2004

12:30 PM - 5 PM –

DuPage Engineers Expo

About the Topic: What are important engineering and scientific advances? How do they relate to what is happening in the same fields today? These are some of the questions we will try to answer at the DuPage Area Engineers Week celebration, held each

year during National Engineers Week, February 22-28, 2004. This year we are celebrating our 20th anniversary, and we ask the community to celebrate with us as we recognize scientific and engineering advances.

The Thursday evening Speaker's Forum on February 26 is in conjunction with a Security Workshop and Expo. The talk will focus on computer security from a layperson's point of view, preceded by an informal super.

The Saturday event, February 28, is free and open to the public from 12:30 to 5:00 PM and features interactive displays and presentations. All presenters will be celebrating one or more anniversaries particular to their society or discipline. Displays this year include aviation science, cryogenics, polarized light, and safety as well as the

Rube Goldberg contest and hands-on SciTech activities, sponsored by ASME for middle-school students (grades 6-8).

Location: Illinois Institute of Technology's Rice Campus, 201 East Loop Road, Wheaton IL 60187.

Sponsorship: IIT's Rice Campus, IEEE Fox Valley Subsection, other professional engineering societies.

For more information: Visit our Web site at www.rice.iit.edu/engineersweek/ or call 630.682.6040 or kozi@iit.edu. For more info on the DuPage program, visit <http://www.rice.iit.edu/engineersweek/> or call 630.682.6040.

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ADVERTISER INDEX

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SCANFAX

ADVERTISING RATES

AD SIZE	1X	5X	10X
Back Cover, 4/c	\$1,600	\$1,400	\$1,215
IBC or IFC, 4/c	1,390	1,270	1,165
Full Page	890	770	665
1/2 Page	650	560	490
1/3 Page	505	435	380
1/4 Page	375	315	270
1/6 Page	260	230	205

Professional Card \$330

One color (PMS) plus black \$300 Four color inside pages \$500

10% premium on b/w position requests, 1/2 page or larger. 15% to recognized advertising agencies on space only. For information on inserts, contact your account representative.

DIMENSIONS

(Dimensions are width by height)

Full Page (7-3/8" x 9-7/8" recommended print area)	8-3/8" x 10-7/8"
1/2 Page	Horizontal 7-3/8" x 4-7/8"
.....	Vertical 4-7/8" x 7-3/8"
1/3 Page	Horizontal 4-7/8" x 4-7/8"
.....	Vertical 2-3/8" x 9-7/8"
1/4 Page	Horizontal 4-7/8" x 3-5/8"
.....	Vertical 2-3/8" x 7-3/8"
1/6 Page	Horizontal 4-7/8" x 2-3/8"
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EMPLOYMENT OPPORTUNITY ADS

\$275 for two consecutive issues. Send type written copy including mailing address, phone number and check payable to SCANFAX Magazine, P.O. Box 6096, Madison, WI 53716.

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Include your business in the "Professional Card" section of each issue of SCANFAX throughout the year, for the low cost of \$330.00 (includes production). Dimensions of a Professional Card are 3-5/8" wide x 7/8" high. Your advertisement can include your logo, slogan and key information about your business. Ads will be listed alphabetically. Sign up today!

For advertising information contact:

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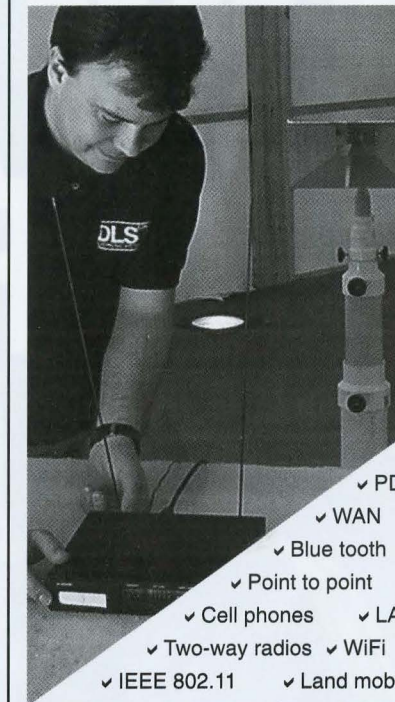
P.O. Box 6096, Madison, WI 53716

PHONE (608) 222-7630 ext. 23

FAX (608) 222-0262

E-MAIL: bethv@slackattack.com

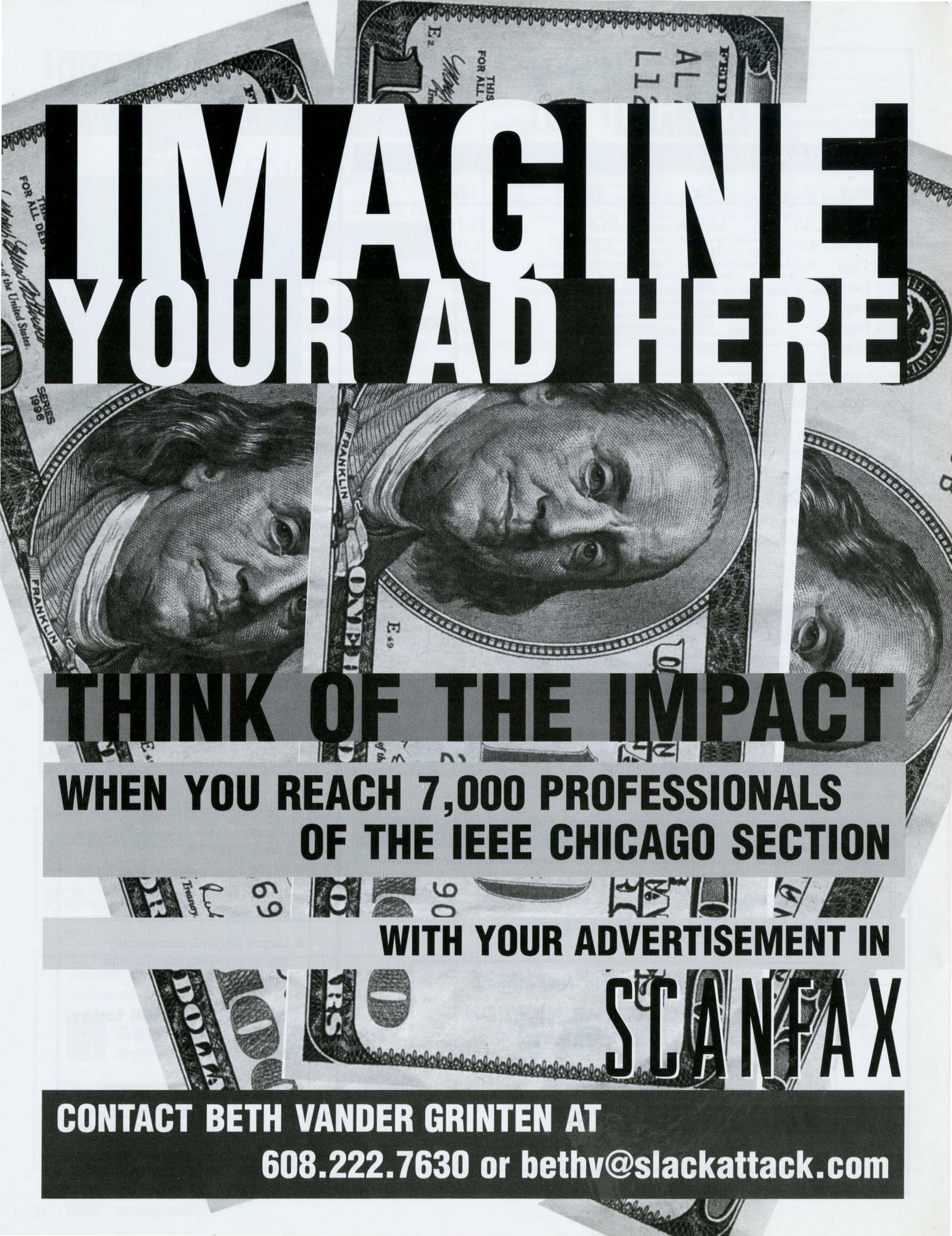
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