Spring has arrived at last! This has been a long and especially cold Midwestern winter. I’m sure you’re all enjoying the relief of warmer weather, sunshine and thoughts of summer as much as I am. Take special care for the safety of your loved ones this season by assuring that everyone uses safety seats for children and seat belts for adults.

The Chicago Section is continuing its tradition of reminding drivers on the Illinois Tollway System to “Buckle Up Baby” for safety. We have distributed more than 400 posters to be displayed at all toll booths throughout the system. Watch for them and spread the word to remind everyone to travel safely.

Meanwhile, your Chicago Section governing board is looking ahead to activities in the fall. A lot of work has already gone into putting together the slate of candidates for next year. Our election will be held at the May 10 meeting. Now, we need to hear from you regarding meeting topic ideas. What topics would interest you? Call me at (708) 971-2442, FAX me at (708) 971-2642 or drop a line to any board member to let us know what your ideas are.

On Tuesday, April 12, our technical presentation will be on the use of electronics in automobiles, an ever-expanding field of progress. This meeting will be held in the south suburbs and will be preceded by a tour of the Ford Taurus plant on Torrence Avenue. See the center pages for details. We look forward to seeing all of you there.

Chuck Cornell
Chicago Section Chairman
### 1993-94 SAE Chicago Section Governing Board Executive Committee

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Company/Consultant</th>
<th>Phone</th>
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<tbody>
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<td>Past Chairman Chicago</td>
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<td>708/865-4339</td>
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Today’s automobiles are using more and more electronic content. Trace is deeply involved in verifying the reliability of electronic components and assemblies in vehicles. Trace works very closely with the “Big Three” and automotive suppliers to test automotive electronics and material to a wide range of requirements. For instance, Trace Labs is presently involved in a major research project for the automobile industry to evaluate new manufacturing processes for electronic hardware. These new manufacturing processes are using new materials that are environmentally friendly.

The purpose of this study is to verify that the new materials and processes used in the manufacturing of electronic assemblies are reliable. Trace is working closely with many automobile suppliers to test the hardware that will go into the next generation of vehicles.

Trace Laboratories has two divisions, one in Chicago and one in Baltimore. Trace’s Chicago Division is approved by the American Association for Laboratory Accreditation (A2LA). The Big Three requires that suppliers utilize independent testing laboratories that are A2LA approved for many of the testing requirements that suppliers must meet. Trace’s East Coast laboratory in Baltimore is approved to the ISO 9002 requirement. Both Trace divisions are also approved by numerous original equipment manufacturers for a wide range of testing. Trace’s accreditations are a testament to their high quality standards and their capabilities in many different testing disciplines.

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Dear SAE Member:

Synchro-Start is pleased to announce the acquisition of DAI Technologies, Inc., of Lisle, Illinois. DAI Technologies will be operated as a division of Synchro-Start Products, Inc.

In business for ten years, Dr. Alan R. Dohner, founder and President of DAI, has guided the company in developing sophisticated electronic engine and systems controls for major engine and vehicle manufacturers. A pioneer in electronic control technology for natural gas engines, DAI has developed the Translator™ Conversion System, a unique engine controller that enables gasoline vehicles (automobiles and light trucks) to operate on compressed natural gas or gasoline. The bi-fuel operation is an inexpensive conversion to a cleaner, more efficient vehicle which will meet mandated emission and environmental standards of the Clean Air Act.

Also developed by DAI Technologies is the PRO-LEAN® system. PRO-LEAN® is a compact microprocessor based control which enables diesel engine manufacturers to convert diesel engines to natural gas operations.

Both the Translator™ and PRO-LEAN® systems were developed with the assistance of the Gas Research Institute.

Synchro-Start looks forward to the marketing and manufacturing of these products while still maintaining the quality and service of our own product line.

If you would like to have more information on the Translator™ and PRO-LEAN® systems, please contact our office at 708/967-7730.

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Cummins Electronics Company, Inc. (CEL) designs, manufactures and markets electronics systems and products designed specifically for use in harsh, heavy duty, critical environments where durability and reliability are key. CEL is a wholly-owned subsidiary of Cummins Engine Company, Inc., the world's leading independent diesel engine manufacturer.

Cummins Electronics produces electronics systems and components for Cummins engines and electronic products for other customers throughout the world, including electronic control modules, gauges, various diagnostic and service tools, and wire harnesses. In addition, the company is a recognized leader in environmental stress testing and provides electronics engineering consulting services.

About 60 percent of Cummins Electronics work is for Cummins Engine Company and its subsidiaries; 40 percent of CEL's research, engineering and production is for North American and International customers.

Cummins Electronics Company has the electronics capabilities to design, engineer, produce and support rugged electronic control systems. CEL is committed to quality, cost and delivery in meeting customer expectations for products and services. CEL has invested in and applied proven state-of-the-art technology and has assembled a talented team of Electronic experts who participate in advanced training on a regular basis.

During 1994, CEL celebrates its eighth year in the electronics business with several new products and enhancements being debuted. Work is also underway on many product launches for Cummins Engine Company, Inc., and its subsidiaries and for manufacturers of products ranging from trucks and forklifts to diagnostic tools and security devices.

For further information, contact Raymond L. Jenks, (708) 590-8824.
AutoResearch Laboratories Incorporated had its origins in the early 1940's as part of the Armour Research Foundation at the Illinois Institute of Technology. Joint development programs with Caterpillar Tractor, General Motors, and the U.S. Army led to the first engine dynamometer tests for measuring lubricant performance.

In response to increasing demand for powertrain and lubricant testing services, the engine, transmission and lubricant testing operation was incorporated as AutoResearch Laboratories in 1959 after separating from the Armour Research facility. With a growing reputation in the engine testing industry, major oil companies and engine builders, such as Chrysler, Cummins, Detroit Diesel, Ford, and Navistar, enlisted the services of ALI for engine performance and development testing.

During the 1960's and 1970's, testing service volume grew steadily, and in 1980 a second facility was acquired for expanded laboratory operations and corporate services. In 1985 ALI obtained the engine testing laboratory at the former ARCO Technical Center in Harvey, Illinois. This acquisition enabled ALI to expand into areas of fuel, emissions and vehicle testing.

Today, a prestigious customer base is served from three conveniently located Chicago area facilities. ALI people are highly skilled professionals...responsive to the needs of clients and in tune with a competitive marketplace.

Most of all, they are dedicated to continuing a proud ALI tradition...a tradition visible in each of the technical services offered.
The above electric vehicle EX-12 is equipped with a 16-bit Motorola microprocessor and drive motor designed and constructed by Motorola. This vehicle is scheduled to race on March 20, 1994, in the Solar & Electric 500 in Phoenix, Arizona.
LABORATORY ENGINE KNOCK DETECTION

by

Dan Meyer

In recent years, combustion pressure technology has received much engineering attention for the performance evaluation of internal combustion engines. Parameters extracted from combustion pressure signals have provided insights into improving engine efficiency and stability.

Today, laboratory systems are being used that augment the standard, normal combustion measurements with abnormal combustion detection and control. Specifically, the onset of engine knocking and other combustion anomalies can be detected and controlled using in-cylinder combustion pressure feedback and digital signal processing.

This presentation will discuss an overview of combustion pressure knocking phenomena, limitations of traditional detection methods, instrumentation for improved knock measurement and detection algorithm fundamentals. A summary of experimental data using a quantification system will also be reviewed.

Dan Meyer has been a Principal Computer Application Engineer at Ford Motor Company since 1990, working on advanced microprocessor control applications. Prior to joining Ford, he worked for ten years as an independent consultant on advanced computer technology to companies which included Ford, General Motor, American Motors, Electronic Data Systems, IBM, and other automotive industry suppliers. He is a member of the IEEE Computer Society and Association for Computing Machinery.

SAE CHICAGO SECTION
TUESDAY, APRIL 12, 1994
FORD PLANT TOUR

1994, in the Solar & Electric 500 in Phoenix, Arizona. The EX-12 should attain over 200 horsepower with a top straight-away speed of approximately 160 mph. Both of these vehicles are constructed from modified Lola IndyCar chassis.

The EX-11 and EX-12 utilize similar high-power devices for switching power to the motor, but the control circuitry for the two systems is quite different. The EX-11 utilizes discrete circuitry only, whereas the EX-12 controller includes a 16-bit Motorola microprocessor. In both systems, all control signals are sent to the power electronics via fiber-optics in order to obtain isolation for noise reduction. In addition, the EX-12 has telemetry capabilities for transmitting critical data via an RF modem. Both systems are able to operate with 196 volts at 600 amps (lead acid batteries), but the EX-12 is optimized to operate with 336 volts at 800 amps (NiCd batteries). The motor for the EX-12 was designed and constructed by Motorola.

Christopher Pratt is Electrical Engineer at Motorola AIEG Automotive Advanced Technology Group.

COFFEE TALK
MOTOROLA AIEG HIGH PERFORMANCE ELECTRIC VEHICLE DEVELOPMENT

by

Christopher D. Pratt

Discussion of high performance DC-brush motor control systems for two electric race vehicles, the EX-11 and EX-12. The EX-11 broke the world speed record for an EV on a one-mile oval with a top speed of 103.270 mph. The EX-12 is scheduled to race on March 20,
for a year-and-a-half working on many electrical design aspects of automotive engine control modules. His experience includes digital and analog hardware design, ignition control software, digital timing analysis, and gate array design, all for internal combustion engine controllers. He wrote the software for the EX-12 motor control system and helped design the interface hardware to the power electronics, dashboard display, and telemetry modem. His experience with electric vehicle technology began at Cornell University in 1991 where he helped design a fiber-optic token ring network for distributed microprocessor control of a mini-van EV provided by GM.

Chairman Matt Jenks is an IC Development Engineer for Motorola Automotive, Energy and Controls Group, electronic engine controls. He is responsible for the development of new integrated circuits to be used in automotive electronic engine control applications. He has been with Motorola for two years. Matt holds a BSEE from Michigan State University.
The bus will be in the parking lot of

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Turn north on Halsted to 163rd, then right to Wallace Street.
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There is No Parking space at the Ford Plant.  
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(See map for directions)  
The best route to take is Tri-State Tollway 294 which joins Interstate 80 to Halsted Street exit. Head north on Halsted Street to 163rd. Turn right (east) to Wallace Street. Park your car in Gino's Steak House parking lot.  
Bus transportation to the plant will be provided by SAE. The bus holds 56 people. The first busload will leave Gino's at 2:15 p.m. The next and last bus leaves at 3:00 p.m.  
The tour starts at 3:00 p.m. and ends at 5:00 p.m. The same bus will return people to Gino's. Persons who tour the plant are expected to attend the dinner meeting.  
* Note: This is the Assembly Plant; not the Stamping Plant.
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Auto racing veterans make vehicle decisions based on calculated risk, instinct, gut feel and experience. But more and more often, Indy racing teams use technology such as CAD/CAM, on-board data collection systems, telemetry and, now, multibody systems analysis.

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As more information is added, the model may help the team zero in on optimal chassis settings for the variety of racing circuits included in each season. On-track testing costs more than $2,500 per hour. Simulation reduces these costs, as well as reducing the chance of injuring a world-class driver or damaging a $350,000 car.

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