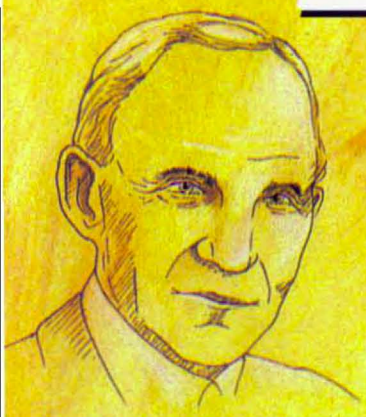
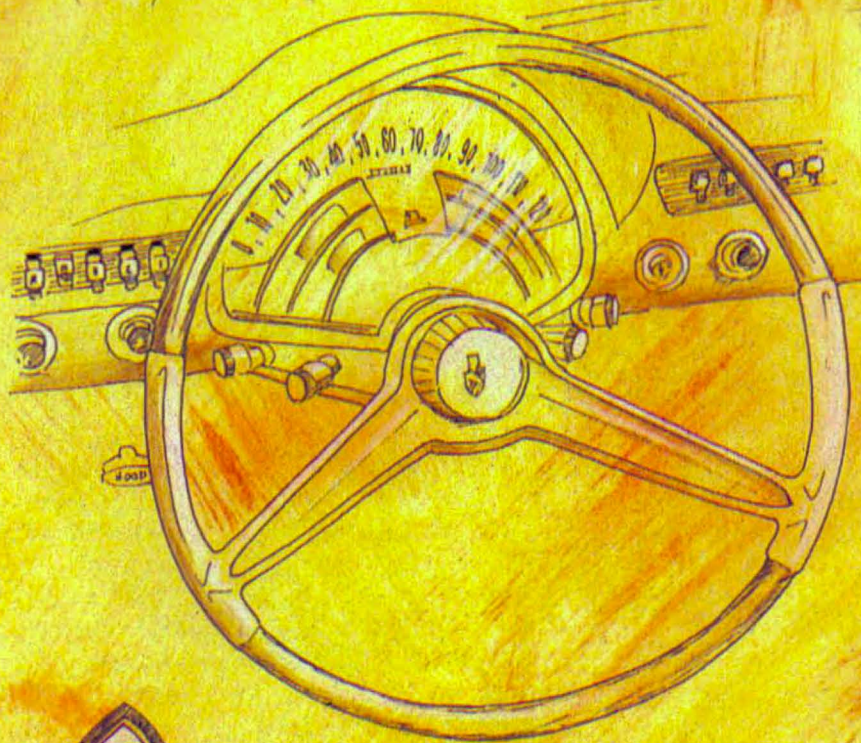
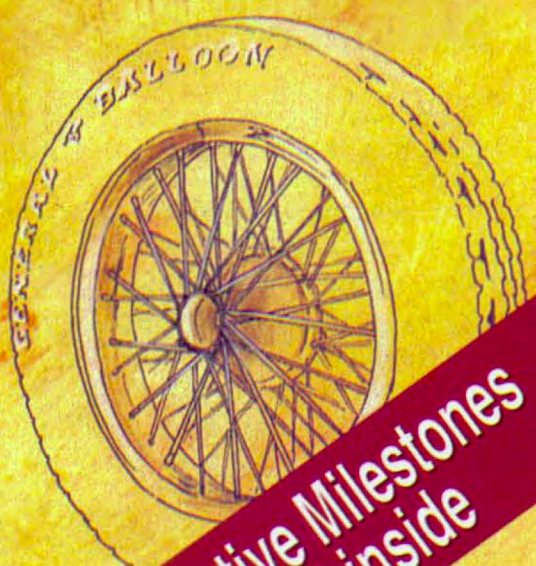
SEPTEMBER 1996

automotive engineering





SAE The Engineering Resource For Advancing Mobility



Automotive Milestones foldout inside

SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
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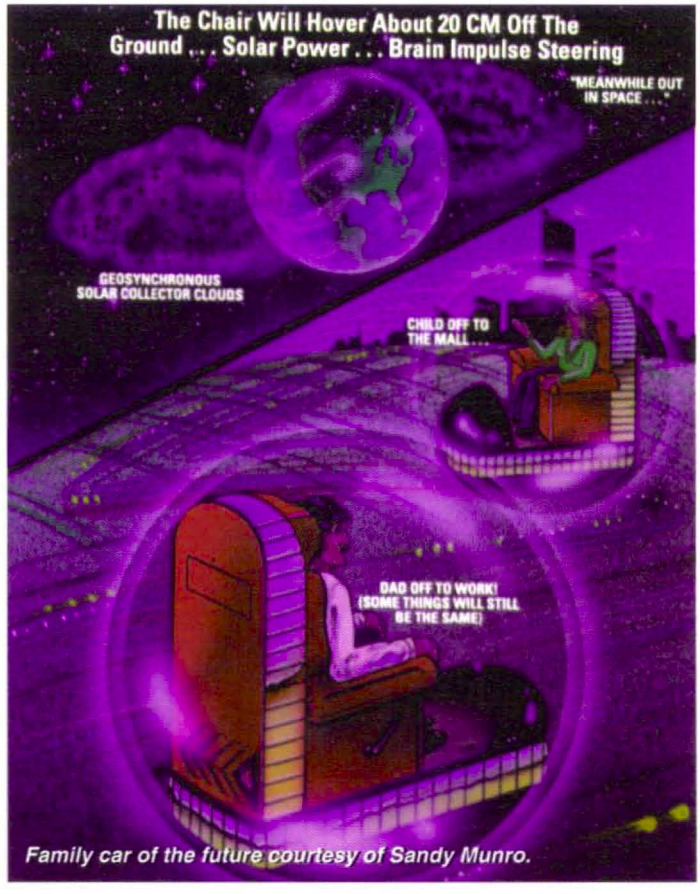
Fast forward to

Travel through time to the year 2096 as auto industry professionals answer the question, "What will the car look like 100 years from now?" Keep in mind that the 1996 reading of their forecasts may come true after another generation of engineers, designers, researchers, and scientists unlock discovery doors to the future.

Warning: the following opinions may be hazardous to readers without a sense of humor or creative visions.

"One hundred years from now the colorant on the outside of a vehicle may be very different from today. The exterior coating will be more resistant to damage, possibly a plastic film that can be custom designed. Automakers may offer a wider color range for some vehicles, possibly signature designs or personalized color combinations. Car buyers could even order their selection using a personal computer. In 100 years, iridescent bicolor effects will likely be commonplace. As today, the marketplace will determine what colors and designs are in vogue. You will potentially see plaids, polka dots, or unique signature designs for every style and shape. Expect the move toward individuality of style to become even stronger."
***Bill Daily**, Color Marketing Manager, DuPont Automotive Products, Troy, MI*

"A personal opinion—All vehicles, including buses and heavy-duty trucks, will have electric drivelines (electric motors, probably in the wheels, with different combinations of on-board electrical energy storage and electrical power generation capability). The idea of burning fossil fuels in reciprocating heat engines will be reflected upon as having been a very primitive practice. The majority of automobiles will be sold as pure EVs with different driving ranges and passenger-carrying capabilities; series hybrid-electric vehicles will provide unlimited driving range capability for four or more people with high fuel economy and low emissions. Heat engines will be small gas turbines with advanced ceramic materials, and will be fueled by natural gas or alcohol. Buses will be either pure electric or series hybrid-electric; heavy-duty trucks will be hybrid-electric with little pure EV range capability (like diesel-electric railroad locomotives today but with gas turbine heat engines). Medium-duty trucks will be both pure electric and series hybrid-electric. Fuels of choice will be natural gas or alcohol. Fuel cells may make it onboard certain types of vehicles as an alternative to gas turbine APUs in series hybrids, but for the most part, fixed-base fuel cells will be used to generate electricity as part of a distributed electric power generation system with very low emissions compared to the large central fossil-fueled power generation stations of today.



Family car of the future courtesy of Sandy Munro.

Plastic composite materials will replace steel and aluminum in automobiles. What is thought of today as high volume modular/flexible production techniques will be replaced by what is thought of today as low-volume production techniques—with much greater flexibility at both low and high volumes. Automobile manufacturers will become a hybrid of what the consumer electronics and aerospace industries are today. Highly functional products will incorporate high technology. Vehicle design focus will be on systems engineering and tailoring the product to functional demands which will vary much more widely than we see today. People will buy cars based on how well they do how many of the things that

21st century automania

By **Kami Buchholz**, *Detroit Editor*

are of specific importance to them. As is the case in the aircraft industry, there will not be much room for exterior and interior styling, yet the products will be beautiful and appealing as the result of their honest functionality. Have you ever seen an ugly aircraft? Maintenance will be a thing of the past. A car will function like a piece of high-end electronic equipment. It will serve its owner until it becomes obsoleted by newer and better products."

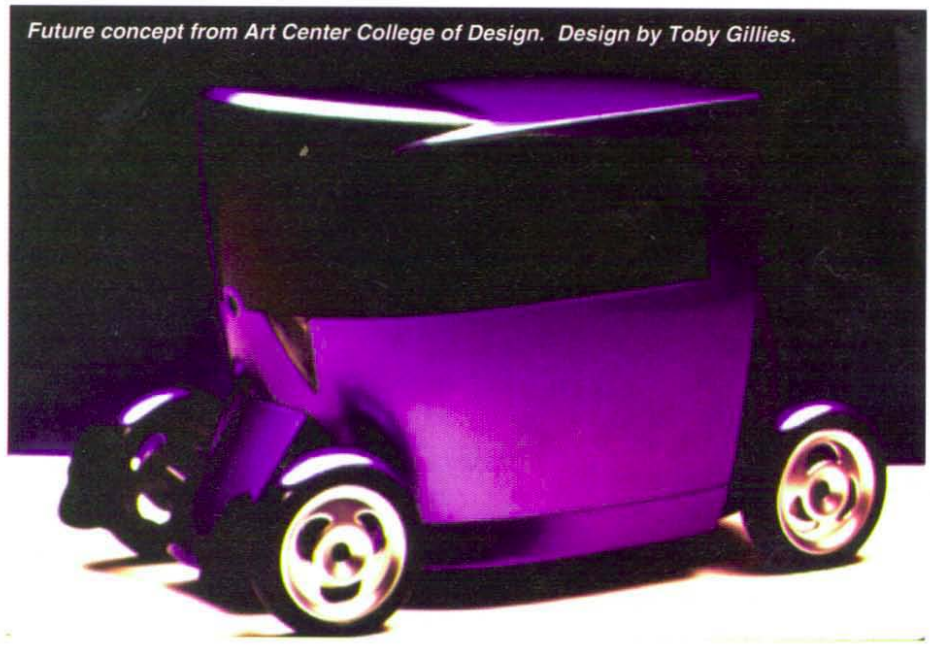
***Bill Mason**, Chief Engineer, Volvo Monitoring & Concept Center in Camarillo, CA*

"The Porsche 911 will be made of 100% recyclable materials, but still be recognizable as a 911. It will likely be powered by some form of solar energy, not by fossil fuels or batteries."

***Frederick J. Schwab**, President and Chief Executive Officer, Porsche Cars North America in Reno, NV*

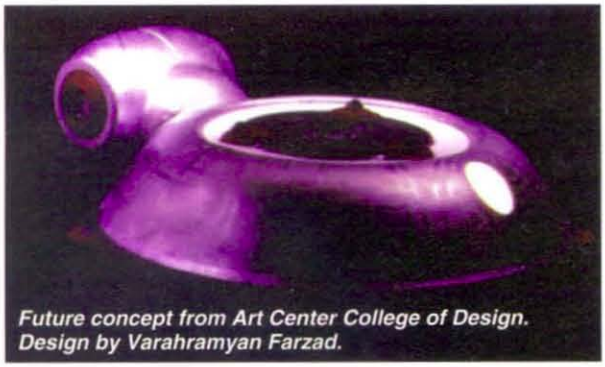
"My glib or off-the-cuff answer is— If we knew what the design would look like, we'd try to do that now." If you go back 100 years, the concept of autonomous vehicles was almost unheard of, as personal mobility was by foot or on horseback. But the idea of personal mobility will be with us in 100 years and longer. As for technology, four wheels are still a good way to get around. There's a 50/50 chance that the car in 2096 will be a four passenger vehicle on four wheels. However, for all we know, in 100 years travel could be a personal energy package that enables a person to get around in ways we don't even know about. In 1896, we were on the verge of flying, but the only way was by hot air balloons. It's really difficult to predict what automobiles will be like in 100 years although it's likely that the basic look won't change all that much in the next 30 years. After that generation, though, things get fuzzy. Only God knows."

***Ron Hill**, Chairman of Transportation Design Department, Art Center College of Design, Pasadena, CA*



Future concept from Art Center College of Design. Design by Toby Gillies.

"I strongly believe that we will see a personal transportation industry 100 years from now. This is based on the following—the general public has become obsessed with convenience and immediate gratification; consumerism will continue to dictate buyer behavior unless checked by a serious depression; the existing automotive infrastructure is a political issue which would be difficult to dismantle rapidly (rather, it will slowly evolve); and the automotive companies will choose to adapt and survive. Will future vehicles be in the form of today's automobile using today's technology? Likely not. Technology will continue to evolve on all fronts. Natural resource and environmental issues will drive power sources from petroleum-based fuels to natural gas, electric vehicles powered by fuel cells, or possibly even solar cells. The car of the future will probably be so environmentally sound that you will be able to eat it. Electronics will continue to proliferate. As a result of the trends in power sources and electrical systems, today's powertrain technology



Future concept from Art Center College of Design. Design by Varahramyan Farzad.

will be completely redefined.

Recyclability will be a mandatory design consideration. Restrictions on manufacturing processes will also dictate material and design trends. I also predict a broader range of vehicle choices (type, size, and style) with a shift back to the basics—decontenting due to affordability and in light of competitive transportation options that will become available for long-range and urban travel."

***John S. Van Alstyne**, Director, Sales & Marketing—Rubber Products Division, Freudenberg-NOK, Plymouth, MI*

"The next 100 years will undoubtedly bring about dramatic changes in personal transportation. From an interior perspective, I believe there will be many advancements in the processes used to design, manufacture, and deliver total interior systems to our customers. Our plan is to provide OEMs with one-stop shopping for completely modular interior systems, with a wide range of features to meet the needs of 21st century consumers. Interiors in the year 2100 likely will focus on ergonomics. This will have such an impact that interiors may be able to adjust automatically to a passenger's personal size and shape or even be custom-ordered further to tailor the vehicle interior to the customer. It's also quite possible our seating systems will be biomechanically smart and may have the capability to prevent back problems from which so many people suffer today. Major changes also are likely in the interior lighting of future vehicles, which may include an illuminating headliner providing uniform lighting throughout the entire vehicle."

***Jinny Runkle**, Director, Product Analysis, Lear Corporation, Southfield, MI*

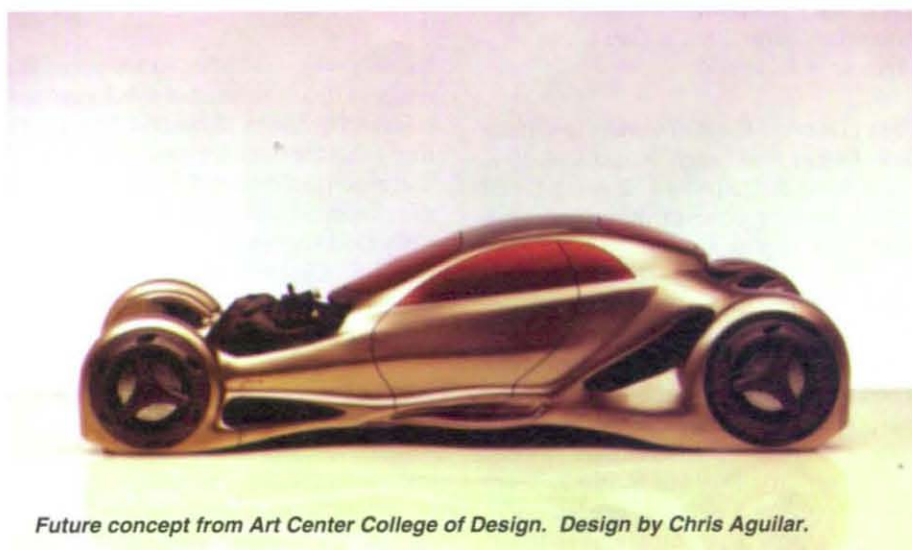
"That is a difficult question since we don't even know if there will be private vehicles in 100 years, especially when one considers the environmental problems created by current practice in vehicle design. I usually answer questions about future vehicle design by looking back at history. This year's 'Eyes on Classic Design' show on the grounds of Edsel and Eleanor Ford's estate provided a chronological overview of the history of U.S. automobile design, starting with the Duryea Motor Wagon. When one arrived at the 1949 Ford with its full envelope body, one saw that its overall proportions are very close to current sedans. Things have changed little in 47 years, and therefore, we can presume that this configuration is likely to remain the dominant package for many years to come. However, the acceptance of the minivan configuration means there are opportunities to achieve smaller, lighter vehicles which don't sacrifice interior space. The Mercedes-Benz A Class is for me the most significant car of the decade. It will influence all other manufacturers because it offers the safety of a large car with all of the benefits of a small car in terms of economy in operation and manufacture. The biggest changes will come in powertrains whose development will be spurred on by environmental questions. Efficient aerodynamics will play an important part in the look of vehicles. However, the major role of the Industrial Designer will remain to put visual excitement and beauty into whatever configuration vehicles assume in 100 years time."

***Carl Olsen**, Chairman of Transportation Design, Center For Creative Studies, Detroit, MI*

"The personal transportation product 100 years from now will be quite different from the cars of today. Instead of the steel, aluminum, and plastics used in today's automobiles, there will be new biomechanical assemblies which will be grown into individual transportation products. The products could be operated individually or joined so families or friends could ride together. The products will be sized to you as though you're wearing them, and will grow as you grow. Each product will fit the individual needs of a consumer, but will have the necessary functions for comfort, safety, and performance. The products' bio surfaces will provide safety, adaptability, and regenerative abilities to repair themselves. They would be extremely compatible with the environment. Instead of being limited to today's highways, 2096 products will have the ability to share expansive transportation paths which provide motion, spacing, accident avoidance, hands-free operation, and destination-programmable abilities. These new paths also will provide the product a slight lift, elevating it from the surface. For the most part, wheels and tires only would be necessary for occasional off-path operation (such as pulling into a garage or traveling rural roads)."

***Dave Hackett**, Studio Director, Calty Design Research (division of Japan's Toyota Motor Corporation), Newport Beach, CA*

"During the next 100 years, cars will be surrounded by an electric safety shield, making it impossible to have an accident. The car will sense an impending accident and brake or turn to evade any collision. That may be expensive, but cost will be offset by lower mass and elimination of



Future concept from Art Center College of Design. Design by Chris Aguilar.

bumpers, safety glass, air bags, and door guard beams, none of which would be needed in cars that don't have accidents. The social costs for property damage and personal injury will also be greatly reduced. The car will be completely out of the environmental equation—no emissions. It may be electric or it could have a chemically fueled engine, such as a fuel cell, or an advanced internal combustion engine still using some form of petroleum product. Getting lost will become a moot point. For most driving, the car will chauffeur you without a chauffeur, allowing its passengers to do other work as they travel. However, the joy of driving will still be there when the driver wants to drive. And, drivers will be able to choose sports car performance or a boulevard ride. With all the advancements we'll think up in the next 100 years, the car in 2096 will still have four wheels, doors, windows, seats, and probably even a steering wheel that could be used when the electronic navigation system is shut off. They'll be exciting. Used as fashion statements or basic transportation, cars will still be great sources of pleasure."

***Donald L. Runkle**, GM Vice President and General Manager, Delphi Energy & Engine Management Systems, Flint, MI*

"I think the family car of the future will be parked in the living room! A car won't be a car. It will be a chair— a personal unit that you can sit in. Based on what I've learned from the military and magnetic technology, there won't be any wheels—the chair will hover. And you won't steer by using your hands, but from your brain's impulses. When you think it, it will respond. The current propulsion system won't exist either. A geosynchronous solar collector will beam energy to the chair. As for convenience and safety, the chair will be in a shroud—an electromagnetic field that shields you from rain and collisions, but does not compromise visibility. There won't be any roads. A geopositioning unit will let us go anywhere we want to."

***Sandy Munro**, President, Munro & Associates (design, manufacturing, and concurrent engineering consulting firm), Troy, MI*

"When I asked the Design Team here in Simi Valley this question, I got a lot of blank looks. Most replies were—'Nobody knows what life will be like in the year 2096'; Others said—'What cars?' and 'Beam me up, Scotty.' We all felt that cars will no longer exist, probably sitting in museums or only being driven by absolute car nuts —with special permission. Our feeling is that most people would be working out of their homes. The technology development in the past 100 years will vanish when compared to the next. Taking global warming, population increase, and the depletion of fossil fuels into consideration, there will come a point where legislation will restrict the use of vehicles as we know them. People will travel very likely in some form of loaned vehicle or use public transportation, driven by some alternative energy, such as hydrogen or microwaves, or even a source that has not yet been conceived. The intelligent highway is already emerging, the navigation and cruise control as we know it, will be controlled by Big Brother and not you! All you do is put in the destination and hope you arrive."

***Charles Ellwood**, Director, Volkswagen of America Design Center, Simi Valley, CA*

"In one hundred years, the need for personal transportation will drastically change. Much of the population will work at home and communication and personal interaction will be a technical reality. Research for vehicles, while done in consumer clinics today, will have already begun in direct brain links. Direct brain links will send electronic impulses simulating the five senses, as well as other ways not currently understood, creating an altered reality. The 'Green Movement' will be a religion not driven by 'don't' or personal guilt, but will be a habit with people respecting nature and resources with preservation for future generations the highest priority. Recycling entire cars and reusing parts will be commonplace. Efficiency will replace performance. How little energy is used will be the standard by which performance is measured, not 0 to 60 mph times. Cars will drive themselves and have the ability to self-navigate and determine the easiest and most efficient way to a destination. The car also will be able to repair things on its own, such as computer malfunctions, as well as schedule a repair appointment when it is most convenient for the owner. Buying a car will be much like buying a house today. The exterior of the car will continue to be artistically pleasing with the interior very personalized. All software will be selected by the buyer and will be upgradable. The interior also will focus around relaxation for social experiences—possibly four seats facing each other. The vehicle interior also will be able to sense discomfort by the driver and will alter to create a more relaxing environment by adjusting the contour of the seat, temperature of the vehicle and even color for mood altering. As personal time becomes more of a luxury, time will be money. Taking the family

Concept car and interior, courtesy of Lear Corp.

terials will be exotic, cost effective, green, and perform more than one or two functions. Vehicles will be much easier to assemble and disassemble. Engineered foams will replace plastics and metals. Power sources will include solar as well as anti-matter. Maintenance will be greatly minimized to the extent refueling may not be necessary. When selecting a car, the purchaser will have access to all information, including strengths and weaknesses as well as recommendations for a vehicle to suit individual needs or preferences. The car of the future will come to you for a test drive—or test ride."

***Brian Booth**, Senior Creative Designer, General Motors Design Center, Warren MI*

"Because Earth's gasoline resources will be nearly depleted by 2096, it will no longer be the automobile's power source. Instead, drivers in 2096 will use two different power sources—one for city driving and one for freeway driving. To drive in the city, drivers will head for the nearest K Mart to purchase battery-sized atomic cells to fuel their cars. They will read about gas stations in their history books. However, atomic cell power will not be necessary on freeways because highways will be automated with magnetic energy power made possible by room temperature superconductivity. With this energy, cars will float above the ground in a computer-programmed precision line-up. For example, when a driver wants to switch into a different lane, he/she will punch the appropriate key on his/her in-vehicle computer. This computer will be linked to the national highway computer system and will automatically adjust the spacing between cars to allow the driver to enter the desired lane without causing an accident. Historically, a major breakthrough in physics occurs every 100 years, so we should expect that a dramatic breakthrough in the next century will change all of our current speculations about the next 100 years."

***Andy Kataoka**, President, Denso International America*