

PRESIDENT
William Shafer
308 S. East Ave.
Oak Park Il 60302
708/383-0186

F. V. E. A. A. NEWSLETTER

MARCH 1990

VICE PRES.
Kenneth Woods
1264 Harvest Ct.
Naperville Il 60565
708/420-1118

TREASURER
Vladimir Vana
5558 Franklin
LaGrange Il 60525
708/246-3046

MEETING NOTICE

The next FVEAA meeting will be
MARCH 16th at
Cragin Federal Savings & Loan
333 W. Wesley st. Wheaton, Il
Time - 7:30 P.M. sharp. Guests
are welcome and need not be
members to attend the meeting.

SECRETARY
Paul Harris
9421 N. Kildare
Skokie Il 60076
708/674-6632

NEWSLETTER EDITOR
John Emde
6542 Fairmount
Downers Grove Il 60516
708/968-2692

DEADLINE for newsletter *STUFF* - in my hands the friday before the next meeting. Editor

THE PREZSEZ

The GM electric car, the IMPACT, has expanded interest in these vehicles. The specifications listed elsewhere in this newsletter indicate they have done a credible job, coming to many of the same conclusions as previous FVEAA work. The car is lightweight, aerodynamic, uses a high voltage battery system with two high speed motors. The major innovation is use of a 3-phase AC drive system derived from the battery.

At the March meeting, we will have a discussion of an AC drive system, comparing it with the DC systems used by FVEAA.

Also, we will review the status of our 1990 exhibition schedule. We particularly need to reach a conclusion regarding a 1990 Rally.

Bill



**FOX VALLEY ELECTRIC
AUTO ASSOCIATION**
6542 Fairmount Downers Grove Il 60516

FIRST CLASS

ADDRESS CORRECTION
REQUESTED

Minutes of the Fox Valley Electric Auto Association;
February 16, 1990

Pres Wm. Shafer called the meeting to order promptly at 7:30 P.M. There were 15 members present and no guests at this meeting. Treas. V. Vana reported Savings of \$884.29 and Checking balance of \$1399.74 for a total of \$2,284.03.

Sec'ty. Paul Harris brought coffee cake in honor of his two (2) new granddaughters..Elise Ivy Miller, 11/30/89 and Elana Rose Riederman, 1/31/90. These two join a previous granddaughter, Mandi Jo Miller. Quite a happy event. (making a harem ?)

Mark Otnes, a new member sent in photos of his car. He lives in Tennessee and is moving to Illinois and hopes to participate in rallies, shows etc. He has a 1981 Electrica 007 (Jet Industries). Pres. Shafer wrote to Jim O'Conner of Edison to help in our exhibit for Earth Day and they will help us with some sort of posters for club and possibly for some cars.

Pres. Shafer also wrote to Eveready Battery to "see if we could use their money" towards one of our projects....don't hold your breath.

The following is our schedule for upcoming exhibits.

1. Sat. and Sun. March 3rd & 4th..Orland Square Shopping Center
Carl Swick, Chairman..Cars..Carls and Vanas cars on hand.
2. Sun. April 22nd..Lincoln Park..Earth Day..We can exhibit 4 cars. Chairman and cars to be determined.
3. Thurs. thru Sun. June 14th thru 17th..Yorktown Shopping Center
Ken Woods, Chairman..Toys for Dads...No cars announced yet.
4. Sat. June 23rd..Downers Grove Heritage Days. John Emde
Chairman. This is a festival for Downers Grove. There will be food, crafts and we will have a Static exhibit. The expected crowd..around TEN THOUSAND people.
5. Wed. July 4th...Wheaton...Pres. Shafer is handling details along with John Ahern..Cragin Fed. might join in with us.

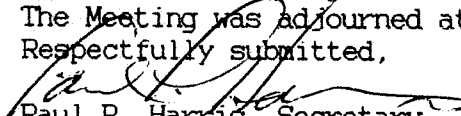
In the works....possible ralley at Fermi Lab or Triton College...Dick Ness looking into locating a good contact. Kit car club group meeting did not have a report as George Krajnovich was not present tonight.....World Electric Calenders are available for \$2.00 each from V. Vana.

New Member Bill Wilcox of Coal City reported of working on his Dodge Omni and completing the electrification process...has everything almost all complete and going to build a tow bar to bring the vehicle to John Stockberger for help and final touches. The project was STARTED JANUARY 1, 1990 and IS MAKING TERRIFFICC PROGRESS.

A discussion followed on the G.M. Impact..price approx \$20,000.00 lots of good ideas..general opinion seems to be "that we won't be out of business" and that this will help spotlight electric vehicles in the long run...A publicity boost for all electric.

The Meeting was adjourned at 9:21 P.M.

Respectfully submitted,


Paul P. Harris, Secretary

Commentary by Peter Huber

WHO WILL BUY THE ELECTRIC CAR?

At the beginning of January, with some modest fanfare, General Motors rolled out a prototype, two-seater electric car. It's called the Impact, as in "environmental." The car comes with good acceleration, pretty good range (120 miles between recharges) and the electric car's classic weakness—a battery pack that costs too much and dies too young. Sooner or later, however, better batteries will be developed.

And then what? Then the fate of electric cars will be up to government types and environmentalists. Judging from their early reaction to the Impact, the bureaucrats and self-appointed protectors of the earth will mostly vote the wrong way. And that will be bad news for both the environment and our national economy.

For now, the gasoline engine enjoys a huge advantage over any potential competition: an established network of fuel and service stations. To crack that advantage, the first-generation electric cars will have to shine in some other way that counts. Barring miraculous advances in battery technology, the edge won't be either the price of the electric car or the cost of running it.

The first potential advantage is national interest. The gyrating price of oil was behind President Carter's economic problems in the 1970s, just as it has been behind Comrade Gorbachev's in the 1980s. Oil imports account for half of our trade deficit and 60% of the Soviets' hard-currency exports. The point is, oil remains the most politically potent commodity on the planet, at both ends of the pipeline. Today, we import two out of every five barrels that we burn—which is to say, we import only a bit more than it takes to run our cars. Get the oil out of the car and we win a huge new measure of national independence.

Then there's the environmental side of things. Contrary to intuition, it's better to burn fuel in the external combustion engine of an



electric power plant than in the internal combustion engine of your average car—even if the fuel is oil, which it rarely is in a power plant.

Technology Management Services of Washington, D.C. has worked the numbers. A good electric power plant converts about 35% of its thermal energy into electricity. The best car engine can convert barely 20% of its heat to mechanical energy at the wheel. Transmitting electricity, charging a battery and running an electric motor entail some energy loss, but refining oil for cars entails even more.

Add it all up and it becomes a good bit more efficient to burn oil and distribute electricity than to refine oil and distribute gasoline. That means that right off the bat generating electricity for transportation causes less pollution than refining and burning gasoline.

Besides, even if it has a smokestack, an electric power plant can be sited miles from urban areas, operated with high-temperature, well-maintained combustors and sanitized with scrubbers and such. Internal combustion engines, by contrast, stick close to people, and exhaust is dirty even when run through the best catalytic converter on the market. And when it's up to millions of individuals to tune the engine and maintain the pollution controls, millions won't. As recent research has confirmed once again, auto exhaust is far harder on the environment than anything coming out of power plant smokestacks.

If the electric car is still a distant prospect, the electric train isn't. Most U.S. locomotives rely on internal combustion diesel engines, hardly more efficient than car engines. Europe and Japan (by contrast) are rushing to embrace all-electric locomotives. Batteries

aren't needed here, and the electric engines are well developed. U.S. companies in fact did much of the developing in the early part of this century. Once again, burning the fuel at a power plant and delivering electricity to the train is considerably more efficient than burning fuel in the train.

You'd think with cleaner air, domestic jobs and a better balance of trade at stake, electric power would win hands down. You would also expect that the liberals and their friends in the environmental movement would be clamoring for electric transportation of any kind. No way. Why will they stand in the way of getting the gasoline out of transportation? It's a sad story.

Too many of the greens launched their careers fighting central power stations, and they shun technology that would require more. The Natural Resources Defense Council dismissed General Motors' Impact project with a sour remark: "We have to generate the electricity somewhere, and that would create a great deal more pollution."

It would create a great deal less. Electric transportation wouldn't even require much in the way of new power plants. Running every car in the country on electricity would consume about 25% of the power existing plants can generate. Battery recharging would occur largely at night, however, in off-peak hours when there is already abundant capacity to spare. As a side benefit, the price of electricity would fall as we squeezed major new revenues out of a sunken, often idle, capital investment.

So who will buy the electric car? No one, until we collectively put a new premium on energy independence, the balance-of-trade relief that goes with it, and the considerable environmental benefits of going electric. Those aren't priorities that any individual is going to set alone. But sooner or later the government may. If not the government in Los Angeles or Washington, D.C. then perhaps the government in Azerbaijan, Tehran or Tripoli. ■

Peter Huber, a senior fellow of the Manhattan Institute, is the author of Liability: The Legal Revolution and Its Consequences.



American Tour de Sol

The American Solar Car Championship

Announcing the second annual
American Tour de Sol
5 Days in New England

May 23 - 27 1990

Commuter Cars

Innovative storage

Racing Cars

Northeast Solar Energy Association (NESEA)
• P.O. Box 541 • 14 Green Street
Brattleboro • Vermont 05302 • USA
802-254-2386

The **Solar Electric Car Symposium** is especially for people interested in building solar electric cars. The speakers are on the cutting edge of solar electric car design, and many of them were actively involved in the American Tour de Sol last May.

- There will be time to meet and talk with the presenters.
- The 1990 American Tour de Sol rules and regulations will be available.
- Useful information: Component sources, books and articles.

The **American Tour de Sol** is a five day race through New England modelled after the original Swiss Tour de Sol. Last year's race was a first of its kind in the USA and it was a resounding success! The aims of the American Tour de Sol are:

- To promote the use of solar energy and electric vehicles, with emphasis on the development of solar vehicles for everyday use.
- To provide a means of education for the public and students of all ages in the areas of solar energy, future transportation and sustainable technology.
- To provide challenging design projects for engineering students in the realm of sustainable technology.

The 1990 American Tour de Sol will be held May 23-27, and will include the following categories of vehicles:

1. **Commuter:** A practical two seater vehicle which travels at normal road speeds and has a driving range of about 50 miles per day.
2. **Tour de Sol Racing:** Vehicles optimized for efficient racing at speeds of up to 65 mph with a driving range of over 100 miles per day.
3. **Cross-Continental:** Vehicles designed to travel long distances at lower speeds.
4. **Innovative Storage:** A new category for vehicles using technologies aimed at battery and fuel-cell research, especially towards bringing visions such as the hydrogen economy closer to reality.
5. **Open:** A category for vehicles that conform to the aims of the event but do not fall into an existing category.

About the sponsoring organization:

THE NORTHEAST SOLAR ENERGY ASSOCIATION a non-profit 501(c)(3) membership organization, has been a leading promoter of renewable energy and energy conservation in the Northeast since its founding in 1974. The organization sponsors important regional conferences and seminars, publishes *Northeast Sun Magazine*, runs the American Tour de Sol and serves as an information center for renewable energy and energy conservation. The 1990 American Tour de Sol organizers are Nancy Hazard and Dr. Rob Wills PE.

A REPLY TO PETER HUBER'S QUESTION

Those who have designed, built and operated an electric car have found that even a car with 25 mile range can be useful for much urban transportation. A good analogy for electric car use is the variety of tools in a toolbox. In it are found pliers, screwdrivers, wrenches, and other tools. A wrench is used for bolts, screwdrivers for screws, hammers when impact is required. Each tool is used for its appropriate task. Limited-range electric cars similarly can be used where they are adequate for the trip.

An electric car can be a life-extender for a conventional car. A present-value analysis shows the electric car has an economic advantage over a 15 year period when its operating, maintenance and 3-year battery amortization costs are compared to the similar costs for a conventional car on a 5-year replacement cycle.

The conventional car as it ages does not perform well for short-range errands. An acquaintance who uses a car in this manner recently found out it can be expensive. The engine began behaving erratically at 40,000 miles. After a \$500 investigation by the car dealer the problem was corrected.

I believe this advantage needs to be considered, along with the energy independence and environmental factors that are usually cited for electric cars.

William H Shafer

Specifications

Dimensions

Wheelbase	95.0 in.
Length	163.0 in.
Width	68.2 in.
Height	47.5 in.
Ground Clearance	6.0 in.
Track, f/r	57.9/48.4 in.
Curb weight	2200 lbs.
Gross weight	2550 lbs.
Weight distribution (with driver, % f/r)	53/47
Aerodynamic drag coefficient	0.19

Motors

Type	AC induction
Horsepower	57 bhp @ 6600 rpm (per motor) 114 total horsepower
Torque	47 lb-ft @ 0 to 6000 rpm (per motor) 94 total lb-ft
Typical efficiency	90-95%

Electronics

Type	dual MOSFET inverters
Maximum current	159 Amps rms to each motor
Maximum system voltage	400 volts
Frequency range	0-500hz
Battery charger	computer-controlled, integral with dual inverter package
Maximum charge rate	50 amps, 400 volts

Batteries

Type	Delco Remy recombinant lead acid 32, 10-volt batteries wired in series, packaged within center tunnel
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Batteries

Capacity	42.5 Amp-hour, 13.6 kWh
Battery pack weight	870 lbs.

Drivetrain

Type	front-wheel-drive, one motor per wheel
Transmission	single-ratio planetary
Final-drive ratio	10.5:1
Lubrication	turbine oil, pressurized oil spray jets
Typical efficiency	94-98%

Body/chassis

Type	fiberglass-reinforced plastic monocoque simulating the strength and weight of an aluminum structure
Tires	low rolling resistance Goodyear radials inflated to 65 psi
Tire size	P165/65R-14
Wheels	14x4-in forged aluminum
Steering	rack-and-pinion
Suspension	two control arms per wheel, coil springs, gas-pressure shock absorbers
Glazing	PPG "Sungate"

Performance

Pounds per horsepower	22 (at gross weight)
Motor speed at 60 mph	9500 rpm
0-60 mph	8.0 sec
55 mph cruising range	120 miles
Top speed	110 mph (rev. limiter at 75 mph)

Impact



Vehicle Safety & Security Report

January 1990

Prepared By Lee S. Cole & Associates, Incorporated

New Fuels - Part IV

The automobile powered by electricity has been the subject of speculative search since the beginnings of its existence. As early as 1899, Hautier was building a car powered by electricity produced by a series of storage batteries. The problem then, and for many years thereafter was limited range, low speed and the bulk of the batteries. Experiments continued from time to time throughout the 20's, 30's and 40's. Some success was reported in reducing battery weight and size, but range remained short and batteries required frequent overnight charging. With the exception of a few short haul delivery services the electric powered automobile remained a rarity.

With the growing concern over environmental pollution generated by motor vehicles interest in the electric powered car has been rejuvenated.

According to a *Popular Mechanics* article in the November 1989 issue, the U.S. Congress appropriated \$14.1 million for research and development of an electric car. European Community Transport Commissioner Karel Van Miert told a seminar of electric transport experts in Belgium "We aim to introduce several million electric driven cars by the end of this century". Peugeot S.A. of France has developed the model 205 and expects to sell 10,000 of them by 1992. In an article appearing in the October 16, 1989 issue of *Automotive News* Peugeot 205's performance was listed as 62 MPH top speed, range of 62 miles, acceleration to 31 MPH is 11.6 seconds. The vehicles use 12 six volt batteries mounted under the hood. The battery powered 205 weighs 660 pounds more than the standard gasoline fueled 205.

BMW has developed a front wheel drive electric powered version of the "3" series. The vehicle has a 584 pound liquid sodium battery mounted in the rear. Power from this battery drives a front mounted Asea Brown Boveri direct current motor developing 145 volts at 2,400 RPMs. It has a 2 speed automatic transmission. First gear is used only on steep grades. Acceleration is 0-1 MPH is 9 seconds, top speed of 62 MPH and a cruising range of 93 miles.

While I was preparing this article for Vehicle Safety & Security Report a representative of General Motors announced on Radio Station KCBS, San Francisco on January 3, 1990 that his company has built a prototype electric car called the "Impact". The vehicle is a two seater, described as a "concept car" and capable of doing 0-60 MPH in 8 seconds according to the GM representative. The Impact takes advantage of lighter weight construction and improved battery technology. The range was announced as 120 miles. No expected date of production was announced. Obviously this vehicle is in early stages of development, but the announced results are impressive. Electric cars may answer part of our future transportation needs in a pollution reduced world.

Mercedes Benz and BMW are also experimenting with hydrogen powered vehicles. Mercedes Benz has a hydrogen powered research vehicle using a 2.3 liter four cylinder engine putting out 105 HP. The engine has a hydrogen distributor instead of a carburetor and an intake manifold, water injector. BMW has produced a 735 iL with a 3.5 liter engine that operates on hydrogen. The May 22, 1989 issue of *Autoweek* reported that the vehicle's fuel tank is insulated with 70 layers of aluminum foil and fiberglass matting to keep the liquid hydrogen at minus 427°F. Chilled hydrogen is injected directly into the combustion chambers. The vehicle has a 186 mile cruising range. Liquid hydrogen has an energy density of 34,000 BTU's per gallon. Gasoline has a density of 110-126,000 BTU's for the same quantity.

Liquid Hydrogen has a wide flammability range, 4.1 - 74.8% according to *Hazardous Materials* by Isman and Carlson, 1980, Glencoe Publishing Company. The authors state "To give you an idea of what can happen in a release, hydrogen gas when mixed with sufficient air to yield 4% of the lower flammable limit, forms a combustible hydrogen-air mixture with a volume 21,000 times that of the original liquid. When hydrogen was released to the atmosphere, ignition occurred 6.2% of the time; in release to enclosures, ignition occurred every time (100%)." Until dangers in the use are overcome its use as a future fuel for motor vehicles is doubtful.

1990 FVEAA MEMBERSHIP AS OF 3/9/90

PHONE #	Y/N ?	MEMBER	ADDRESS	CITY	ST ZIP
708 668-1426	Y	JOHN AHERN	624 PERSHING AVE.	WHEATON	IL 60187
708 968-7052	Y	ALFRED BRINKMEYER	4323 DEVON ST.	LISLE	IL 60532
708 629-3989	Y	JACK CAHILL	1 S 736 VISTA AVE.	LOMBARD	IL 60148
713 391-7110	Y	R. NEIL CAMPBELL	2909 HACKBERRY	CATY	TX 77493
708 228-5952	Y	DALE COREL	595 GATES HEAD NORTH.	ELKGROVE VIL.	IL 60007
708 968-2692	Y	JOHN EMDE	6542 FAIRMOUNT AVE.	DOWNERS GROVE	IL 60516
301 992-0621	Y	WM. T. FORDE	9257 GRAPEWINE CT.	COLUMBIA	MD 21045
708 841-0180	Y	JOHN FOSTER	14318 UNIVERSITY AVE.	DOLTON	IL 60419
708 968-2486	Y	ALEXANDER GLOWIAK	101 RUMSEY RD.	WESTMONT	IL 60559
313 995-1897	Y	MATTHEW GREEN	3921 LOHR RD.	ANN ARBOR	MI 48108
708 877-7290	Y	HENDLY HALL	530 LAWN DRIVE	LOVES PARK	IL 61111
708 232-0344	Y	EVERETT HARRIS	214 NEBRASKA ST.	GENEVA	IL 60134
708 674-6632	Y	PAUL HARRIS	9421 N. KILDARE	SKOKIE	IL 60076
708 484-0525	Y	RALPH JOHNSON	209 E BUTTERFIELD # 109	ELMHURST	IL 60126
708 XXX-XXXX	Y	RICHARD JOHNSON	1124 S. CUYLER	OAK PARK	IL 60304
312 282-4828	Y	THOMAS KAMINSKI	4828 W. WARWICK	CHICAGO	IL 60641
312 792-0781	Y	CHARLES KETCHIK	5810 N. MOODY	CHICAGO	IL 60646
708 834-0370	Y	GEORGE KRAJNOVICH	17W381 EISENHOWER RD.	DAKBROOK TER.	IL 60181
708 534-2686	Y	JOHN KRUEGER	10 LOCUST PL BOX 102	MONEE	IL 60449
708 437-0453	Y	DONALD KUBICK	249 ARLINGTON HTS. RD.	ELKGROVE VIL.	IL 60007
708 850-7246	Y	LAD KUCERA	8 ARTHUR AVE.	CLARENDON HIL	IL 60514
708 XXX-XXXX	Y	CHARLES MARICICH	P.O. BOX 201	CALUMET CITY	IL 60409
708 343-1919	Y	RONALD MASLANA	726 BALMORAL AVE.	WESTCHESTER	IL 60154
313 478-8082	Y	JOHN MC CUBBIN	31850 ALLISON DR.	FARMINGTON HL	MI 48018
708 742-2052	Y	CHARLES MILLER	156 S. WESTON	ELGIN	IL 60120
708 299-3497	Y	JERRY MITCHELL	4517 LILAC	GLENVIEW	IL 60025
317 784-8561	Y	PHILLIP MULLIS	325 WOODHILL DR.	INDIANAPOLIS	IN 46227
708 584-6057	Y	KENNETH MYERS	1303 INDIANA	ST. CHARLES	IL 60174
312 889-7757	Y	RICHARD NESS	2129 N. NARRAGANSETT	CHICAGO	IL 60639
708 469-3434	Y	JOHN NEWTON	22 W 450 AHLSTRAND DR.	GLEN ELLYN	IL 60137
708 537-6069	Y	JACK NIKOLICH	370 S. JEANNE TERR.	WHEELING	IL 60090
615 579-3131	Y	MARK OTNES	507 TIPTON AVE.	KNOXVILLE	TN 37920
708 560-0715	Y	RAYMOND OVIYACH	16800 LARAMIE AVE	OAK FOREST	IL 60452
219 874-3171	Y	HAROLD PASCHACK	1400 ELSTON ST.	MICHIGAN CITY	IN 46360
708 255-1665	Y	FRANK PIETROLONARDO	1122 E. THOMAS ST.	ARLINGTON HTS	IL 60004
708 XXX-XXXX	Y	BOB RANDERSON	25 S. SPRING	LAGRANGE	IL 60525
708 879-7847	Y	RICH REZNY JR.	227 S. JEFFERSON	BATAVIA	IL 60510
708 485-0334	Y	HENRY SETTON	3625 ARDEN AVE.	BROOKFIELD	IL 60513
708 383-0186	Y	WILLIAM SHAFER	308 S. EAST AVE.	OAK PARK	IL 60302
708 879-0207	Y	JOHN STOCKBERGER	28643 NELSON LAKE RD.	BATAVIA	IL 60510
708 852-2978	Y	LES STONE	4736 FOREST	DOWNERS GROVE	IL 60515
708 429-4955	Y	CARL SWICK	7550 WILLOWOOD CT.	ORLAND PARK	IL 60462
708 246-3046	Y	VLADIMIR VANA	5558 FRANKLIN	LAGRANGE	IL 60525
815 634-4605	Y	BILL WILCOX	125 S. BROADWAY	COAL CITY	IL 60416
708 420-1118	Y	KENNETH WOODS	1264 HARVEST CT.	NAPERVILLE	IL 60565

New Batteries Mix Gases To Generate Electricity

FUEL CELLS, a technology for generating electricity, show promise for powering electric vehicles, portable telephones and other devices.

The battery-like devices mix oxygen with hydrogen or other substances to produce electricity. Developed at Bell Communications Research Inc., the research arm of the Bell operating companies, the technology appears capable of producing power from devices far lighter and smaller than conventional batteries.

Fuel cells aren't new. The highly efficient, nonpolluting power sources already are being used in spacecraft. But they require a complex apparatus for mixing pure fuel gases, which are potentially explosive, and they have proved too complicated and too costly for widespread commercial use.

The new version doesn't require pure gases. A nonexplosive mixture of air and hydrogen will do, says Christopher Dyer, a materials scientist who invented the novel cell. Even cheaper fuels, such as air and methanol, or wood alcohol, also work, he says.

The cell consists of a thin layer of an aluminum compound between two layers of metal, such as platinum or nickel. The sandwich causes direct conversion of chemical to electrical energy, producing "a remarkable" amount of power when exposed to an air-hydrogen or other fuel mixture, Mr. Dyer says. In principle, he adds, the idea could easily be scaled up for commercial use by depositing the thin films with existing techniques on long strips of plastic that could be rolled into compact spirals.

Mr. Dyer envisions power packs that could be recharged instantly by popping in fresh fuel capsules. Bell Communications, which first disclosed the patented technology in a report last week in the journal *Nature*, says it already has gotten a number of calls from companies that may license the invention.

FOR SALE

2 Prototype kit cars
80" wheelbase 1000 lbs.
Rack & pinion steering
4 wheel disk brakes
18 HP 2 cyl Briggs engine
One car has metal frame
One has fibreglass frame
Suitable for electric conversion
About \$2000 ea w/engine
Less without engine

Call: Jack Nikolich
708 537-6069

FOR SALE

TECHUMSEH 16 HP single cylinder overhead valve horizontal shaft 4 cycle gas engine. orig. \$1050
New now only \$550

Call: Jack Nikolich
708 537-6069

FOR SALE

12 8' Fluorescent lights
Universal Mfg. Co. Rapid start - with shades and 2 bulbs - used - good cond.
\$12.00 ea. 1 or all.

Call: John Emde
708 968-2692

WANTED TO BUY

I'm looking to buy a CITI-CAR complete or parts. Yours or one that you know of.

Call: Jack Nikolich
708 537-6069

NEW PRODUCTS

DC switching solid state relay

If you want to get away from the problems of metal relay contacts, you use solid-state relays. They don't arc, they don't spark, and they can be controlled by logic-level signals. However, most solid-state relays only switch ac, which is scarce in cars. This line of solid-state relays is for dc, at voltages up to 200, and currents up to 12 A (resistive). See you local Magencraft dealer, or contact Magencraft Electric Co., 1910 Techny Road, Northbrook, IL 60062-5376, (312) 564-8800.

How Electric Fields May Damage Human Cells

SCIENTISTS have suggested how faint electric fields around power lines and appliances may affect us.

Until now, theories about the controversial subject have failed to provide a detailed explanation of how these minuscule fields could affect human cells, possibly increasing the risk of cancer, as some researchers have reported.

The fields are too weak to cause chemical reactions, and they may not even be able to surmount "thermal noise," the constant stirring up of molecules as a result of body heat and metabolic processes. Mysteriously, however, some test-tube experiments have indicated cellular effects from fields that apparently should have been drowned out by the noise.

Now two scientists, James C. Weaver at Massachusetts Institute of Technology and R. Dean Astumian at the National Institute of Standards and Technology, have devised a theoretical model that may explain the mystery. While not establishing that weak fields can have biological effects, their work makes reports of such effects more plausible.

The scientists' model shows how the fields might rhythmically bend molecules called enzymes, perhaps causing metabolic processes they control to speed up. Chemicals made by such accelerated processes might pile up in the cell over time, having a cumulative effect. "The main point of our paper is that you can't dismiss out of hand weak field effects" because they seem too small to rise above thermal noise, says Mr. Weaver, whose paper was published in the Jan. 26 issue of the journal *Science*.

CANADIAN GASOLINE PRICES have gone up with the latest tax increase. Regular leaded is \$2.67 a gallon and super unleaded is \$2.85. The Canadian dollar doesn't buy quite as much gasoline as does the U.S. dollar but those prices are still about double those in the States. From the Vancouver Electric Vehicle Association Newsletter for February 1990.