soft technology

Technology for a Sustainable Future No 42 Summer 1992 $3.95*

Inside:

- House paint making you sick? There are alternatives!
- An epic adventure: the Energymobile heads north
- Setting up a battery bank: important do's and don'ts
- DIY double glazing: we show you how
- Transport traumas: the way forward

...and more inside...

Mudbricks, wind and solar: One family's success story

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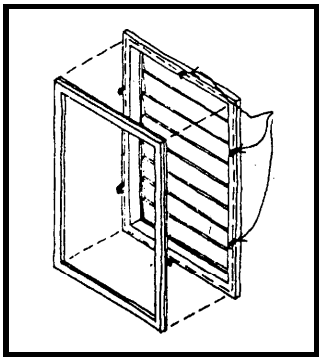

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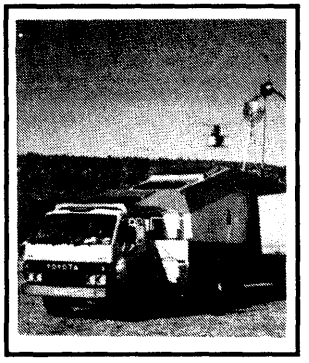

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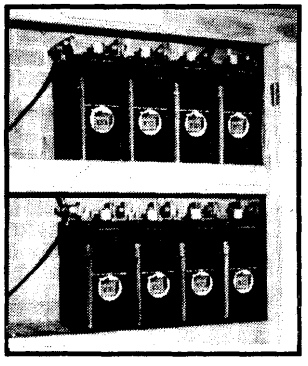

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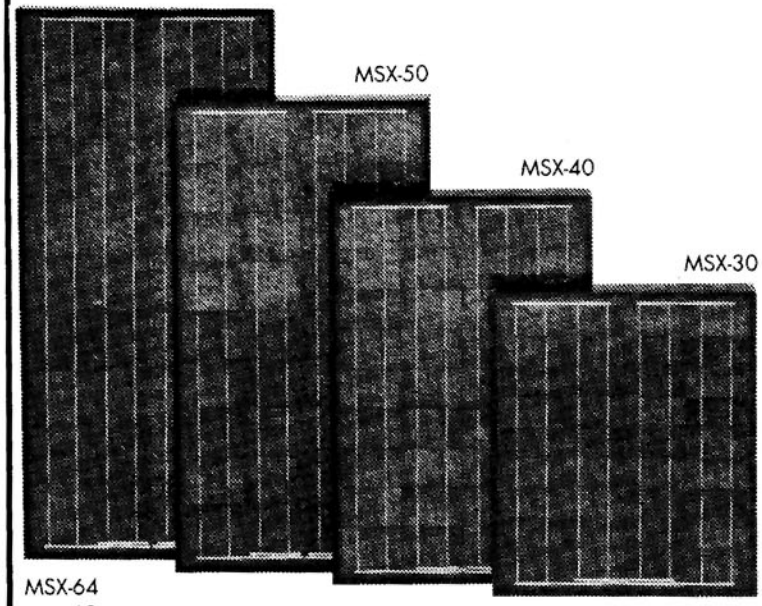

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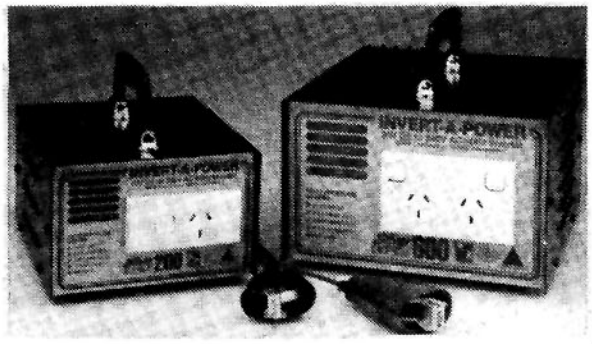

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Hello!

It's the last night prior to going to the printer, and there's good news. For the first time for as long as I can remember we will be going home early.

No last minute panic, no coffee saturated euphoria as sun-rise approaches. Instead there's a chance to open the windows of our city office, watch the rain, and listen to it compete with the sound of the air-conditioning plant on the building next door. Five minutes ago the rain was winning.

So why the change? What has happened to stop the sleepless nights? Well, we have discovered two wonderful natural resources....

Ten minutes walk away from our office are the local botanical gardens. From time to time, when the city gets to be too much, we visit. We wander along the paths, sit by the lake, sunbathe on the grass. And you know what else we do? We talk about Soft Technology; what to put in the next few issues, how to improve the quality of what we do and how to make the process run smoothly.

These gardens have inadvertently provided us with a painless way to do urgently needed advance planning. Taking other people with us has also helped us find the second great natural resource.

As I said last time in "Hello", "putting Soft Technology together is a big job these days". Well it has finally dawned on us that a job shared is a much easier job. Of late, we have been drawing on the skills of our wonderful pool of volunteers to help with the magazine - and you know what? In the process, we've all learnt new things and had a lot of fun.

And that's good news all round.

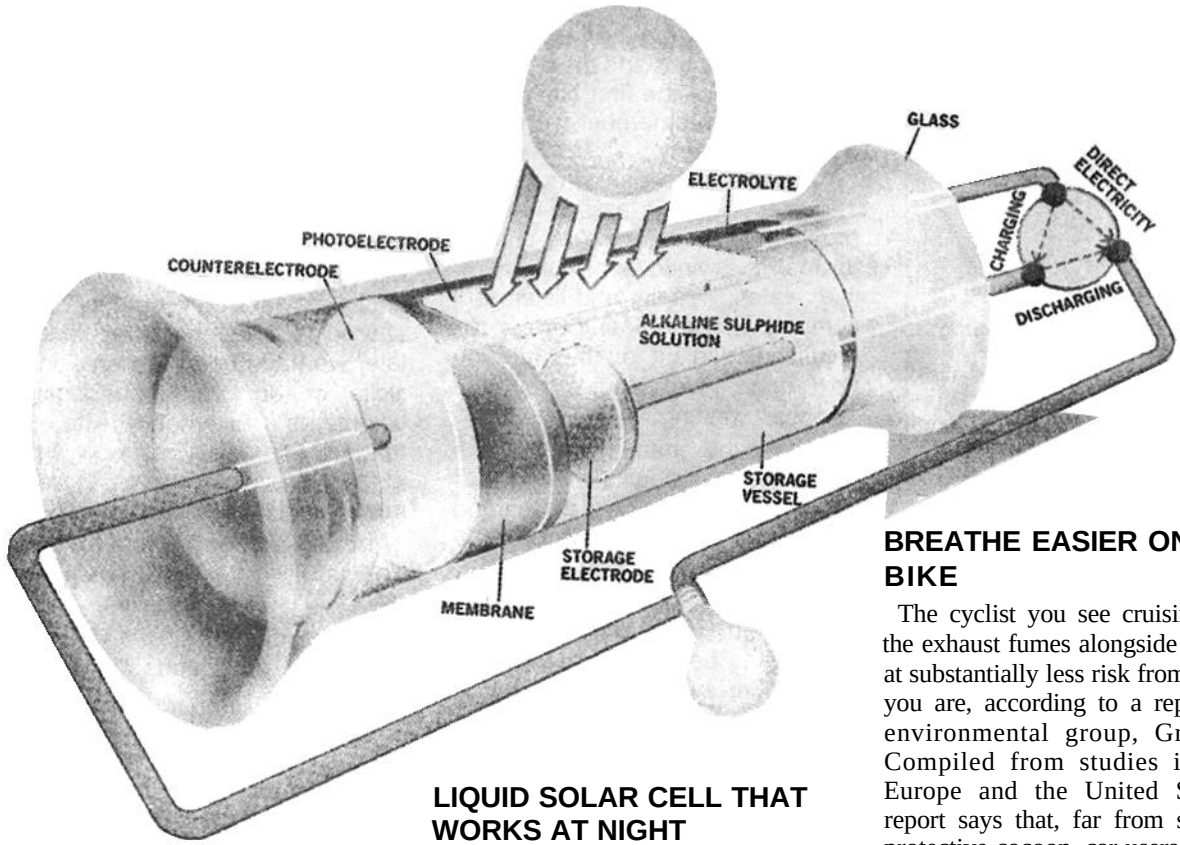
So, if you find life is getting you down, go for a walk in the park. It does wonders. And don't forget the help of friends when the pressure's on.

There goes the rain again.... heavier than ever....can hardly even see the city lights.....could almost think I was in the country.

Bye
Mick Harris.

Snowed under with paperwork - before going to the gardens!

Energy Flashes



CFC PHASE-OUT

Northern Telecom, from Ontario, Canada, is the first major electronics company in the world to completely eliminate ozone-depleting CFCs from its production process. An expenditure of $1 million to develop a new technology, has led to saving $4 million in chemical bills. The company initially sought to replace CFC-based solvents used to clean electronics boards, but came up with a novel solution to eliminate the need for cleaning entirely. A very fine flux mist is sprayed onto the boards and is then boiled off at the end of the manufacturing process. Company officials calculate that by the year 2000, they will have saved $50 million and will have prevented about 8200 tons of CFC-based solvents from entering the atmosphere.

Northern Telecom Media Release

LIQUID SOLAR CELL THAT WORKS AT NIGHT

Dr Stuart Licht, at Clark University in Worcester, Massachusetts, has produced a photoelectrochemical cell. It resembles a cross between solid-state solar cell and a wet-cell battery. The cell combines semiconductors, (which make electricity when hit by light rays) with electrodes bathed in electrolytes (which enables the cell to charge up). When there is bright light, the cells both make electricity and recharge. In low-light conditions, their stored energy can be tapped, thus overcoming the problem of intermittent sunlight. At this stage the cell's overall efficiency is 11.3 percent, and has a very short operating life due to corrosion of the electrodes. However, Licht is working on both of these problems, and his results point to a commercial cell in a few years.

Further information: Clark University Research Office, 950 Main St, Worcester, Massachusetts 0161

BREATHE EASIER ON A BIKE

The cyclist you see cruising through the exhaust fumes alongside your car is at substantially less risk from them than you are, according to a report by the environmental group, Greenpeace. Compiled from studies in Britain, Europe and the United States, the report says that, far from sitting in a protective cocoon, car users can be exposed to pollution levels that are up to 18 times higher than those affecting cyclists and pedestrians.

Conditions inside cars improve with air conditioning and deteriorate when fan heaters are switched on. Concentrations of pollutants can also be increased by congested traffic, lower speeds, older vehicles and faulty exhausts.

The levels of benzene, a carcinogen for which the World Health Organisation says there is no safe threshold, were found to be 2 to 18 times higher inside cars than outside. Levels of carbon monoxide were 2 to 14 times higher, and those of nitrogen dioxide 1.3 to 2.5 times higher, both exceeding recommended safety limits.

The report also says that recent data from the United States, where the majority of cars are fitted with catalytic converters, shows similar levels of pollutants inside vehicles.

The Independent, August 1992

Energy Flashes

NEWSPAPERS IN TOP FORM

A substitute for plastic-foam packaging could also help with the recycled newspaper glut. Moulded Fibre Technology (MFT), produce the new packaging entirely from ground up newspaper and water. It's similar to the material egg cartons are made of, but it can be formed to complex, customized specifications and rivals extended polystyrene in cushioning ability. It equals plastic foam in a drop test, and is better than plastic in damping vibration - a problem in shipping.

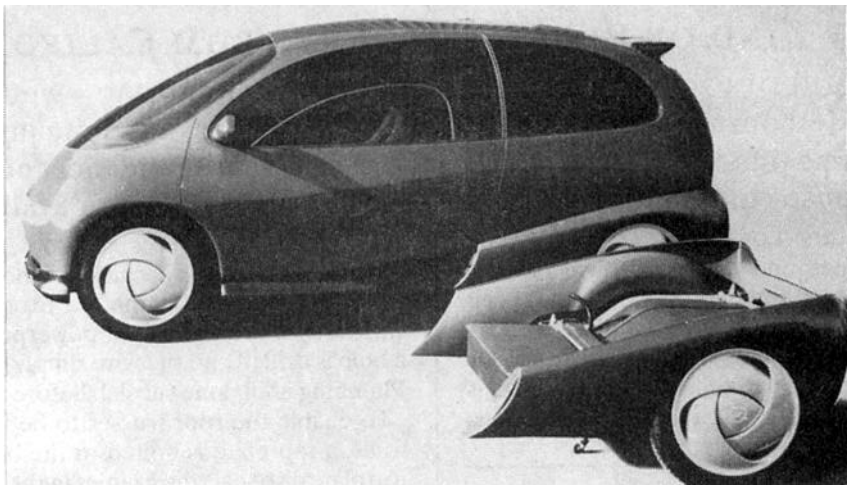
Computer engineers create a carton-model, which is then converted into an aluminium mould. The repulped newspaper is vacuumed into the mould and the water vacuumed out. Then the forms are dryed. The process fits the most stringent recycling legislation and is cheaper to produce than polystyrene.

Popular Science, July 1992

WALKING AND BIKE RIDING ARE BACK!

A research project was launched in Sydney this month, aimed at establishing the place of both pedestrian and bicycle travel as integral parts of the overall transport system. The project is funded by the Roads and Traffic Authority. It is to be carried out by the Institute of Transport Studies, a Research Centre within the University of Sydney Graduate School of Business, which seeks to address contemporary transport problems. The centre is providing a PhD scholarship to investigate "Bicycle and Pedestrian Demand for Urban NSW". The centre cited such advantages as friendly city centres, less pollution and traffic congestion, and improved health through exercise, in reestablishing pedestrian and bicycle travel as important and integral parts of transport.

Further Information: Linda Shboul, ph: (02) 550 3544

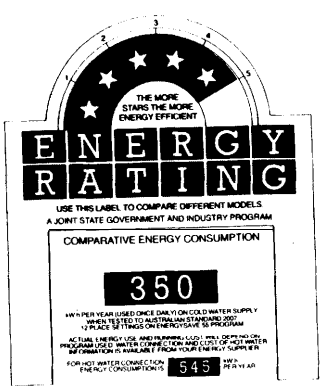


The Opel "Twin" concept car with its interchangeable electric unit

CARS WITH "SPLIT" PERSONALITIES

The Opel 'Twin' concept car has an interchangeable rear-end power module with plug-in connections. When being used for urban driving, the electric unit is snapped into place. However, if the driver plans a longer highway trip, the local Opel dealer removes the module and replaces it with the petrol unit. The electronic unit's batteries are a high energy "cold" type which recharge in about two hours.

SAE-Australia, July/August 1992



WIND-POWER SOLUTION FOR REMOTE PHONES

A wind powered telephone box is under test by British Telecom (BT). Power for the kiosk is provided by a small windmill which generates sufficient electricity to light the box throughout the night. If the technology proves successful, BT plans to use it to light telephone boxes in remote areas of the UK. At present, it can cost up to 12,000 pounds (A$28,776) to connect a kiosk in a remote region to a power supply, whereas the wind power unit costs only 450 pounds (A$1,079).

European Technology Review, July 1992

APPLIANCE LABELLING GOES NATIONAL

In 1991, the Australian and New Zealand Minerals and Energy Council (ANZMEC), the council of energy ministers for each State and the Commonwealth, agreed that energy efficiency appliance labelling should be implemented in all states, to become a truly national program.

In April 1992, ANZMEC accepted recommendations for a National Labelling Co-Ordination Committee and a National Technical Advisory Panel (TAP). TAP will provide Government and ANZMEC with expert advice on appliance labelling issues, such as marketing, technical and legal aspects. The first meeting of TAP was held in August, and had representatives present from retailers, manufacturers, Standards Australia, consumer groups and government.

On Demand (ESAA Journal, September 1992)

Look - No Mortar!

A NEW KIND OF BLOCK MASONRY FROM CALIFORNIA

IMAGINE BUILDING A BRICK HOUSE without using mortar - wouldn't it fall down? A Melbourne company, LEEOH Constructions, has done just that. The company claims that their building system is the strongest and most cost effective method of house construction available - and they certainly don't fall down!

LEEOH stands for Low-cost, Energy Efficient, Owner-built Homes, and that is exactly what they are. The system used to build the houses has been specially developed to suit unskilled owner-builders. Instead of using mortar, which usually requires a qualified tradesperson, a special finish is applied to the bricks by LEEOH Constructions after they have been stacked.

by Stephen Reardon

The system originated in California, where it was developed to withstand the cyclonic conditions and bushfire conditions experienced there. Now, after nine years of development, testing and modifications to suit the Australian regulations and conditions, the system is available here.

Several buildings, including a two-storey house, have been built using this method in Australia and, judging by the one I saw being built in Wantirna, Vic, they are extremely strong. Of course, the house is not simply made from stacked bricks, but it is true that no mortar is used between them. The secret to doing this is that the bricks used are the larger concrete bricks about 320 x 140 x 160mm.

Whether the house is supplied as a kit or built by the Company, the process follows the same steps, starting with the pouring of a concrete slab. Once the slab is laid, the first course of bricks is laid using traditional mortar techniques. This is essential to locate the walls properly and is very simple to do.

Next, the windows and doors are stood in place and held up with props. Now the rest of the walls can be built by simply stacking the bricks one on top of the other. Because of the size of the bricks, the resulting wall is quite stable, even before the special render is applied.

The special render is usually supplied by the building company before the roof trusses go up. If the house is of two storeys, then the render is applied before the second level is erected. The render itself is the key to whole operation. It consists of two coats, a structural coat and a finish coat.

The structural coat has glass fibres in it to reinforce it, and has the appearance of chopstrand fibreglass. The finish coat is much finer, and is available in a range of colours and textures. For example, the outside can be made to look like sandstone, and the inside to look like plasterboard.

Electrical wiring poses no problem according to the builders. This is because, as the bricks are hollow, the wires can simply be dropped down the cavities. Where a switch or powerpoint is required, a hole is drilled and the wire simply pulled through. Plumbing is all done subslab before the walls go up.

To enable the roof trusses to be attached to the walls, a top plate is bolted to the brickwork. This top plate also seals the cavities in the bricks, creating an insulating effect.

Normally, to eliminate the need for internal framing, the internal walls are also built using the system. The result is a house with high thermal mass.

This means that the high level of mass in the walls and the floor can store a lot of heat, enabling the house to have a very stable internal temperature. This would contribute to the insulating performance of the house, especially in areas where there is a high range between day time and night time temperatures.

Proper design to optimise the use of the thermal mass would result in a house which is quite solar efficient.

The roof trusses are supplied in the kit, and the roof can be either steel decking or tiles. The design of the house is very flexible - virtually any shape can be built and it seems any choice of window or framing construction can be accommodated.

The main advantage of this method is its simplicity. The technique eliminates the need for framing, masonry, insulation and lining. The stacking part is easy and the critical coats of special render are applied by the company. This last means that the risk of failure is virtually eliminated.

LEEOH Constructions claim that there is a 30% cost saving compared to other forms of building. Judging by the simplicity of the operation and the elimination of a number of expensive trades, the cost saving seems reasonable.

For further information about the LEEOH constructions method, contact :

LEEOH CONSTRUCTIONS
Suite 1, 42B Wantirna Road
Ringwood Victoria 3134
Australia
Telephone: (03) 879 7175
Facsimile: (03) 870 4234

Mudbricks, Wind and Solar

One Family's Success-Story

In 1976, Bruce and Chris McKenzie bought a block of land in Gippsland, in Southern Victoria. They began building a house in 1982, and moved in three years later. They now have a lovely, passive solar, mudbrick house which is connected to the outside world only by a telephone line; all their other systems are completely independent.

Alexandra Oke and Adrian Braun

When Bruce and Chris began looking for information about solar passive housing in the seventies, they drew a big blank and a lot of funny looks. The only information they could get was from America, for passive solar design in snow country.

At that time energy was still cheap, and Bruce and Chris found their idea of building a low-energy, self-sufficient house falling on puzzled cars. Some communal groups bad similar ideas, but as this lifestyle didn't appeal, their only option was to go it alone.

So they found a suitable block of land (one of the last rainforest blocks in the area) and commenced a building process which was to take over three years.

Coping with two jobs, three very young children and building was a huge effort. So much, in fact, that after getting the house livable in 1986 and moving in, the McKenzies simply stopped.....

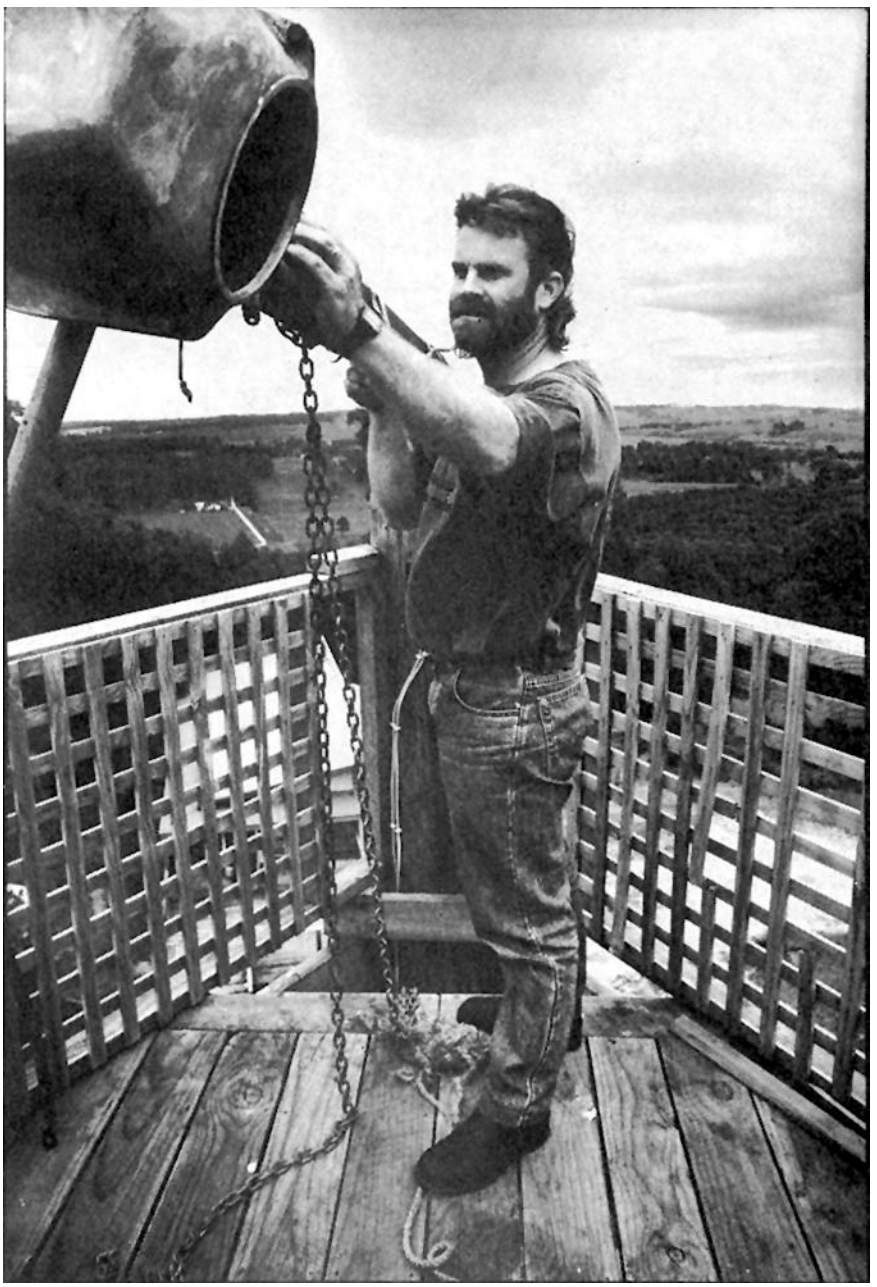


PHOTO BY ADRIAN BRAUN

Bruce and his windgenerator, high above the property.

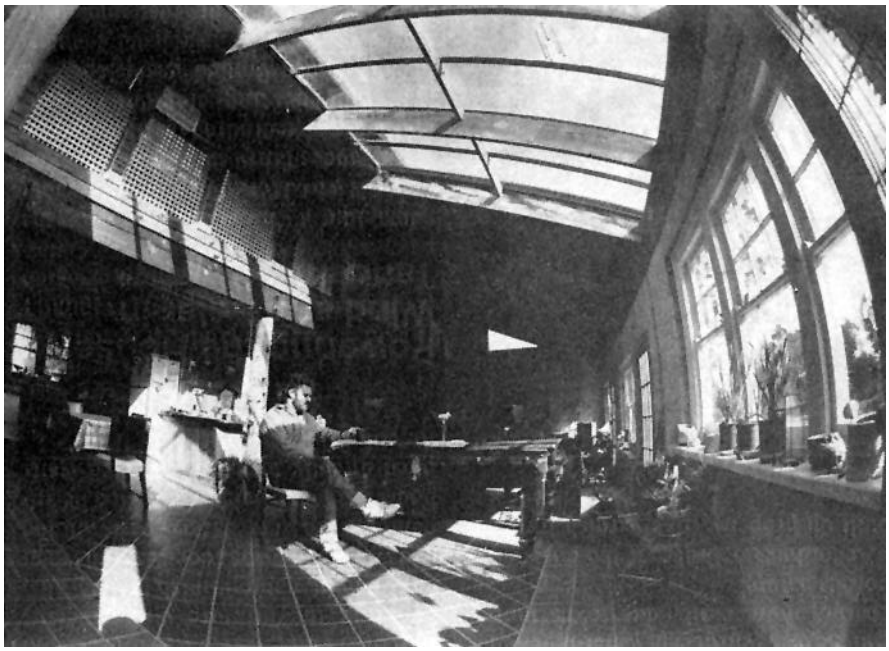


PHOTO COURTESY OF THE WEEKLY TIMES

After two years they began working on the house again. The break was necessary. Hefting a mudbrick is roughly equivalent to hefting a car battery, so they can only be placed one at a time, making building slow and physically demanding.

Bruce and Chris' advice is that before starting to build you should spend considerable time talking to people who have already been through the process, and see if your expectations match others' experiences.

An enormous amount of physical and mental energy is necessary to keep an owner-built project going, and it is better to be prepared for this than to start with false hopes.

Bruce investigated ma king mudbricks, and decided on a low-clay pressed brick. He used the press and mixer afterward to make bricks for other home builders (which he recommends as easier than making them yourself), so he and Chris came into contact with other people in the process of building. Their impression was that it was one of the quickest ways to break up a marriage!

The House as a Passive energy system

All of the McKenzie's home systems - power, water and heating - are complementary and integrated. To begin with, the house itself is a solar collector.

The house is a split-level open plan design, facing north with clerestory windows. The eaves overhang the upstairs windows to block the sun from Oct 22nd - Feb 22nd. This means the house catches the maximum amount of light and solar radiation in the cooler months, allowing passive warming of the terracotta thermal mass floor.

Winter heating is aided by a large skylight, which is actually a clear section of the north facing roof made from toughened glass. In winter it is left clear; in summer the glass is either whitewashed or covered.

Ceiling insulation was done using Zostera, a particular species of seagrass which works well as thermal insulation.

'The seaweed was obtained during a visit to the beach. It was then sandwiched between the pine lining boards and the colourbond roof. Bruce would also like to try sheep wool insulation.

The mudbricks that make up the walls provide thermal mass, so even though, individually, they conduct heat readily, together they help to keep the temperature within the house stable. While we were there, the house stayed at a pleasant "room temperature", although outside, the weather turned nasty and the temperature plummeted.

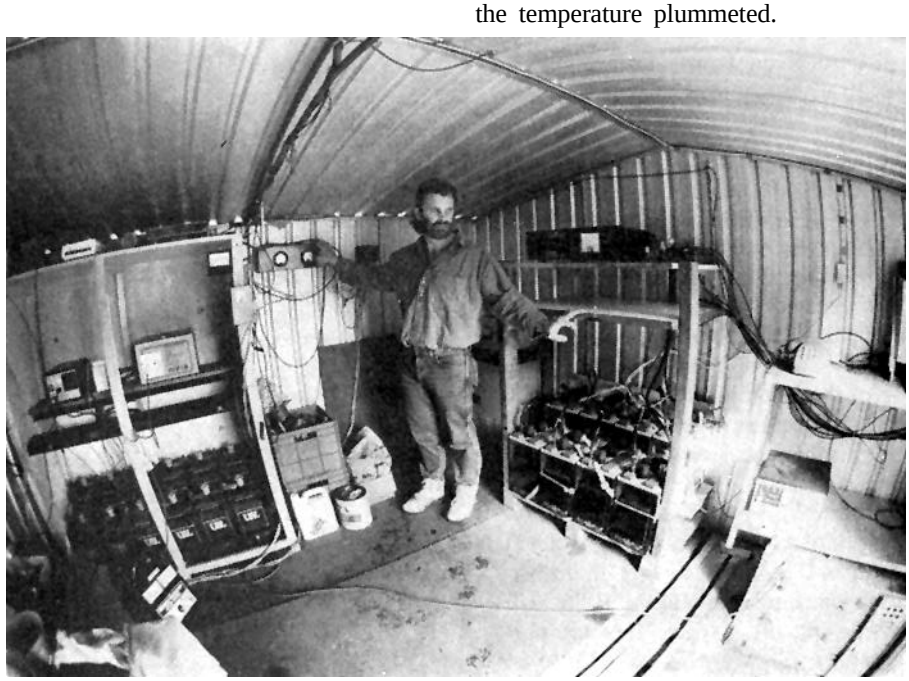


PHOTO COURTESY OF THE WEEKLY TIMES

In the hot weather, the family opens the top clerestory windows at night to let the cool air reduce the temperature inside. A similar flow can be set up by opening the south windows and front door. Open latticework around the stairs and balcony helps with this flow.

First catch your mudbrick...

The mudbricks which make up the house have an interesting composition: a low clay content (20%), a high gravel content and the balance made up with silt.

This makes for a very stable mudbrick which will not shrink or expand in response to the environment - useful when you are deliberately using the bricks to heat and cool an entire house!

The tradeoff for the low clay content is that the brick is not naturally water repellent, so waterproofing is essential. But the clay will accept water-repellent coating more easily due to its more porous nature.

According to Bruce, if the coats are built up properly (like varnish for example) the owner will have a stable and water-repellent house.

The first coating (which uses a 1/20 mix of Bondcrete with water), is sprayed on and will soak in 12-15mm, forming a bond with the brick. If a stronger mix is used the waterproofing layer may crack and possibly peel off.

The subsequent coats use bondcrete in increasing strength, until the final coat of 1/4 mix, which was brushed on.

Mixing the mixture with riversilt gave a light, natural finish to the walls, and white paint was added as well when painting the few darker parts of the house. (Plastic paint could then be applied directly to the bondcreted walls for colour).

PHOTO COURTESY OF THE WEEKLY TIMES

Powering the House: Wind and Solar In Tandem

Just like a "normal" residence, the house is wired for AC 240V throughout and includes fairly standard household appliances, including a dishwasher, (with the heating element disconnected) and a bottled gas fridge and stove. Bruce and Chris have found it more efficient to do just one dishwasher load a day, putting in a kettle's worth of hot water Lighting is compact fluorescents throughout - essential when you are generating your own energy and want to be as efficient as possible

The 3 kilowatt-hour daily household requirement is produced by photovoltaic (PV) cells and a wind generator. The house's position on top of a hill with an average windspeed of 7 m/second makes it ideally situated for wind powered generation - which sup plies 80% of the household's power requirements.

Direct current from these devices charges a battery bank which then works through an inverter to produce 240V AC.

For the technically curious, the windgenerator is a 75W locally made prototype, and the PVs are 300W capacity.

The battery bank is made up of eight 6V, 207Ah BP PVSTOR batteries, and the inverter is a 1500W Invert-a-Power modified square wave. (An additional filter is used for powering digital devices. There is also a Woods Dialomatic 20 Amp charger.

Backup is provided by a 5kVA petrol generator depending on the weather: Bruce and Chris find they need to augment the PVs and windgenerator by running the petrol generator about two hours per week. This also powers a pump which draws from their two large water tanks to keep the 4500 litre header tank topped up. Hot water is provided by three solar flat plate collectors and a "Lopi" slow combustion stove, which also warms the open plan air space.

To reduce the time the inverter runs the header tank pump, stereo and answering machine are run on 12V

A word about computers. Bruce and Chris have a PC which they also run from an invertor. Now, computers or most digital equipment for that matter, don't much like the square wave form put out by most inverters - even the modified square wave of the McKenzies inverter can cause digital havoc. Bruce overcame this problem by inserting an inline filter between the computer and the inverter. The filter smooths the wave form further to produce a much more palatable power source for the computer. Bruce reports that the computer runs faultlessly.

Evolution vs Prefabrication

Bruce and Chris have found that their house and power systems have evolved with their family and needs. Their upper floor has recently been partitioned to form separate spaces for the children now they are older. They helped design and build the rooms, and have informed their parents they will build their own houses on the property. (Bruce has a spot picked out - a mere 20 minutes' walk from the house!)

Another example of the evolutionary process is the balcony around the house which started as scaffolding to get the bricks to the upper level of the house.

"When we have the time"

Bruce is still trying new ideas - he is installing a hydro system in the creek on his property, and will put in an adjustable pergola on the north-facing side of the house to cope with the variable weather.

"When we have the time" is a phrase that kept coming up in the conversation - for things such as worm farming and proofing parts of the house not often used, and energy consultancy. But Bruce and Chris seem very pleased with their house, and also (amazingly) still a little surprised that it works as well as it does.

After 14 years of building his own systems, and 6 years of designing them for other people. Bruce has become aware of a need for information and education for people investigating options and setting up power systems. The information deficit is nothing like as bad as the one he and Chris encountered when they started, but there is still a great need to simply help people to see that there are alternatives, and present this information in an understandable way.

If the information is available, householders might see that they have the option of starting small, and expanding the system as circumstances change, rather than setting up a large and expensive system all at once.

The McKenzies' are a good example of what can be achieved. They have created an efficient and self-sufficient system that will change as they do. Given their success to date, I'm sure, they will "find the time", and keep making their house and systems better.

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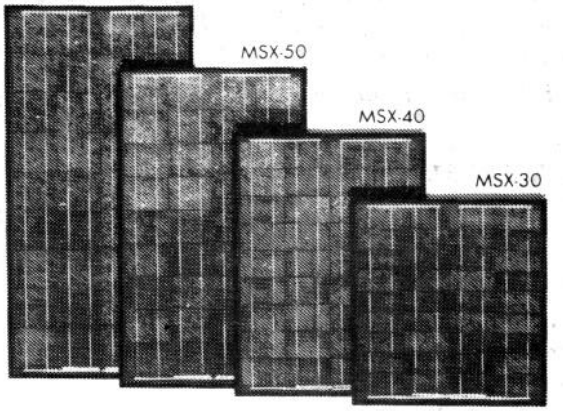

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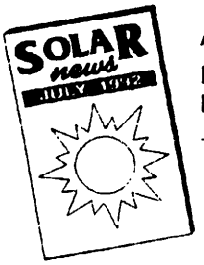

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An Epic Adventure:
The EnergyMobile Heads North

In July this year, the ATA's new pride and joy, the EnergyMobile, hit the road for the first time. Just building this huge new mobile energy display was adventure enough for most of us, but when Bruce & Chris McKenzie and family took it on its maiden voyage to Darwin, they found the fun was just beginning . .

Chris McKenzie

The departure was hardly auspicious. After two or three weeks of panic working by a dedicated band of volunteers, the EnergyMobile was finally ready. The reporter from our local newspaper, *The Sentinel Ties,* came to write a story on the EnergyMobile, and we felt excited and packing was completed.

On leaving home, the family (Bruce, Chris, and children: Travis 13, Heidi 10, and Spike 8) heaved a collective sigh of relief that we were finally on our way. Our elation was dampened, when Bruce noticed smoke coming from the trailer brakes.

The next 24 hours were so unpleasant, they wouldn't bear repeating. We had to reconcile the kids to the idea that we may not go to Darwin at all, thinking that there was a major manufacturing problem with the trailer brakes.

We went to a motel for the night, and Mick Harris of the ATA contacted the brake manufacturers, who agreed to open their factory the following day (Sunday).

After several hours work, the fault was found to be very simple - a wiring fault with the brake controller, which meant that touching the truck brakes locked the trailer brakes on fully.

When it was fixed, what a relief!

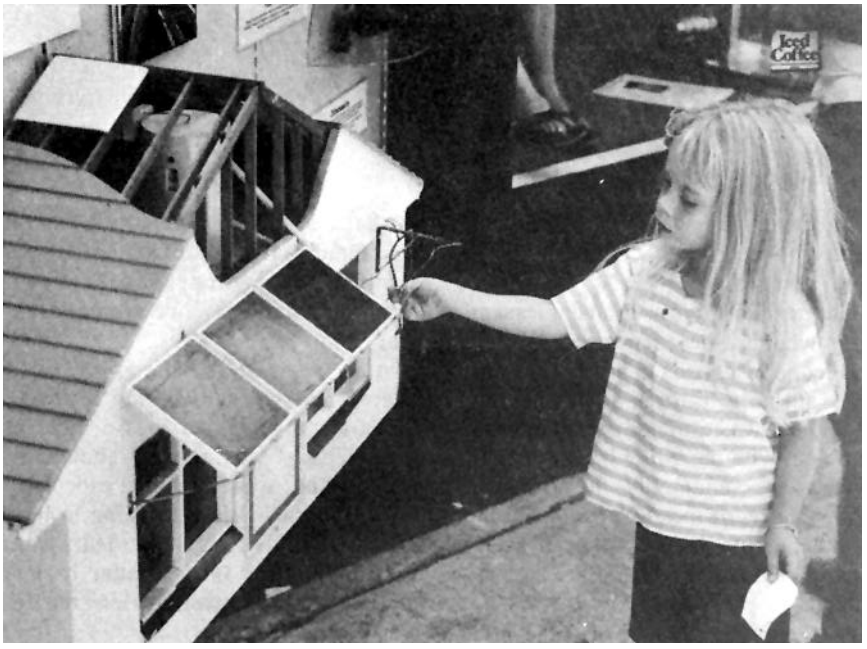
Under Way

We left Melbourne early (5.30 am) the following morning, and quickly the next problem became apparent. It took us nearly two hours to get to Ballarat. We had a head wind, and during the trip we found that any sort of head wind slowed the EnergyMobile down markedly. Some days we averaged less than 70km/hr.

After breakfast at Ballarat, the wind abated and we settled into a steady 85km/hr, and arrived in Adelaide at about 7pm. I was nervous about descending the Adelaide Hills, especially Devil's Bend. This was going to be a good test of the brakes. Our fears were ill-founded, as the exhaust brakes worked extremely well, making our descent trouble-free.

Through Adelaide to a caravan park and bed - all very tired after 15 hours on the road. The EnergyMobile has space for two to sleep, but not five, so we brought a tent for the kids.

As the next day would be another early start, we didn't erect the kids tent. Travis slept in the back seat of the truck, and Heidi and Spike on mattresses on the floor of the trailer. Tight but comfortable. The next day was Adelaide to Glendambo.



A headwind all morning made for slow going, but it moderated in the afternoon. We weren't prepared for the beautiful scenery north of Port Augusta. The sight of the salt lakes was magnificent. Due to the delay in leaving Melbourne we only had one more day before we had to be in Alice Springs. This was a long day - 690km in 13 hours, including meal stops, and we slept the night at Kulgera. The next morning we arrived in Alice Springs, found the caravan park where we had booked an on-site van, and unpacked.

Alice

The showgrounds were already a hive of activity. The side shows were all set up, and Bruce had to quickly learn the art of finding your site at a show! Not an easy task! We spent a couple of hours setting up and cleaning the truck for display.

Alice Springs' show days (two of them) were an eye opener for us. There were people at the EnergyMobile constantly, no time for lunch or a cup of tea. Luckily Bruce and I work well together. The Greenspeed trike was very popular, and Travis became very good at explaining it to people, and keeping an eye on it. ***(For a close look at the Greenspeed recumbent trike, see page 25. Ed)***

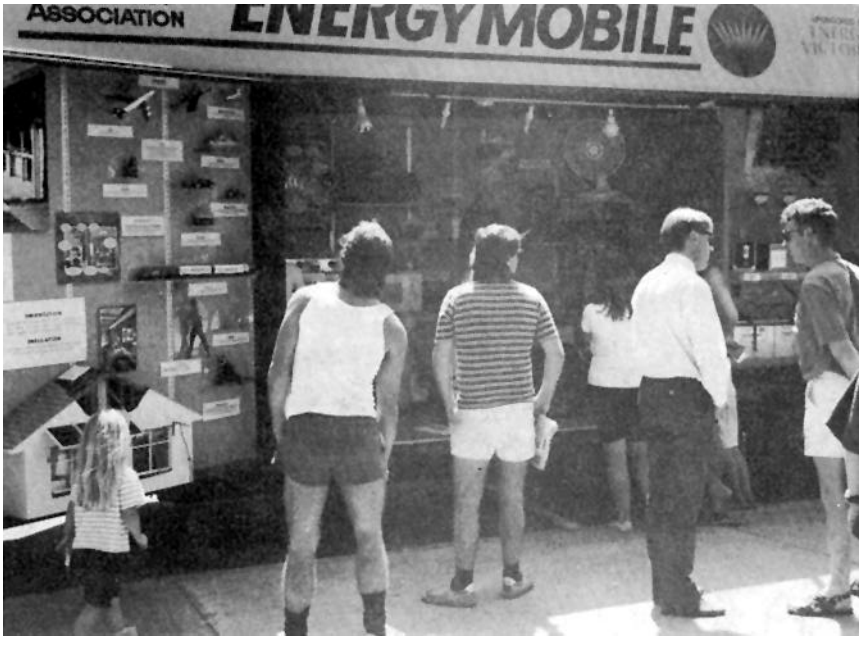
The displays worked well, except that I had to quickly put labels on the appliance display, so it made sense. The microhydro display was particularly useful in attracting interest to the rest of the displays. There were many requests for information and brochures. There is not much of this sort of information easily available in the Northern Territory. The mechanism for raising the wind towers worked perfectly every time, and always drew a crowd of watchers.

Bruce and I talked to lots of people from diverse backgrounds: people from local Aboriginal communities, station owners who run their homes on diesel generators, tourists interested in renewable energy for their caravans, people interested in reducing cooling costs by passive design, and people just interested in looking at the unusual EnergyMobile.

At the end of the show on Saturday night, we were exhausted but felt we had been successful. We sat down on a grassy slope with outback station hands and Aboriginals, and enjoyed a great display of fireworks.

The kids had also learnt a lot. Spike had budgeted $9.00 to spend at Alice Springs, but spent the lot in two hours at a side show alley. He was broken hearted because he spent $3.00 on a ride on dodge-em-cars, but he hated it because it was too bumpy!

He soon wised up, and at the rest of the shows we attended, he became very skilled at sniffing out anything that was free. At the Darwin Show he even managed to get two free T-shirts from one of the political parties.



Tennant Creek

Next stop - Tennant Creek. We arrived there mid morning the day before the show, and found a caravan park right next to the showground, where we booked in and set up for the night.

We then visited the showgrounds to find our site, and were told by the show president that we were required to stay on site. So we went back to the caravan park, packed up the truck, and moved it to our site at the show.

What a dusty site, and right next to the booze tent! A source of education for the kids over the show, and a good place to find dropped coins in the morning! Dust got into absolutely everything in the EnergyMobile, even into the Vegemite jar.

Tennant Creek was a different show - it had very much of an outback feel! We met a lot more Aboriginal people than we normally get the chance to in the city. There were a lot of enquiries about solar powered pumping. Unfortunately, we had no information on board.

To remedy this, we made contact with Mono Pumps, and were able to distribute a lot of their information. This was a unique experience, and a very enjoyable show.

Solar '92

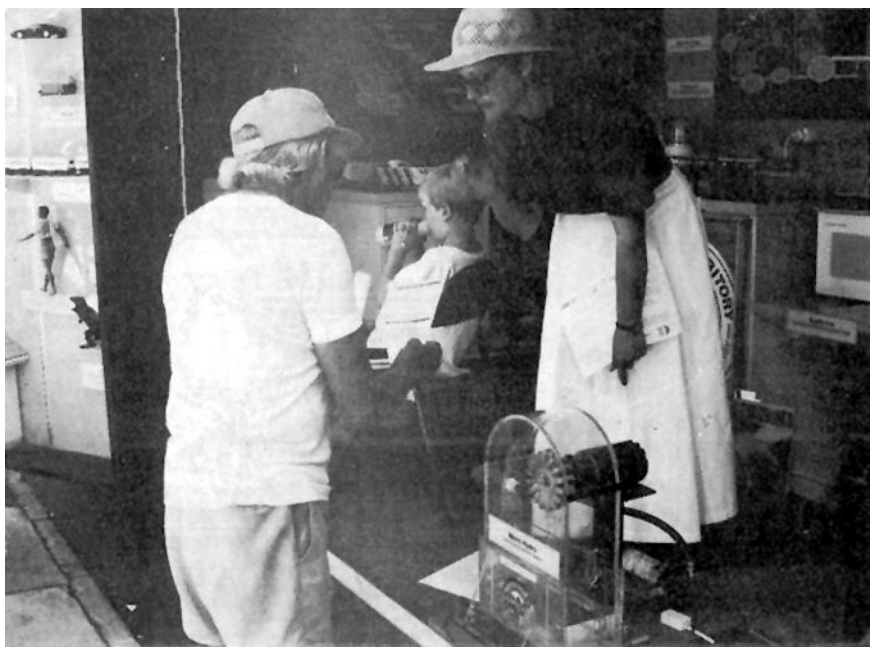
We now had two days to get into Darwin for the ***ANZSES Solar '92*** Conference. We found time for quick stops at Mataranka for a swim in the thermal springs (magnificent) and at Katherine Gorge to see the beautiful Katherine River.

We arrived in Darwin at about llam, and made contact with the Northern Territory Department of Mines and Energy, who were co-ordinating the ***Solar*** '92 conference. We discovered that they had organised TV interviews at 3pm. It was panic stations for a few hours! We found our accommodation and transferred our belongings to rooms at University House. Then it was all hands on deck to get rid of Tennant Creek dust! We made it with enough time for a quick shower!

The TV interviews were very successful, and we obtained a video copy of them from the Northern Territory Department of Mines and Energy.

During the next two days, the conference was held at the Sheraton Hotel in Darwin. The EnergyMobile was on display at the end of the Smith St. shopping mall in the CBD of Darwin, and created a lot of interest. Shoppers were amused when we cooked our lunch of hot dogs in a saucepan on the solar cooker. A lot of delegates came and had a look at the **EnergyMobile,** and some valuable contacts were made.

Thursday night, the Department of Mines and Energy arranged for us to be on display at the Mindle Beach Market, next to the casino. Then we were very busy, and again there was lots of interest.



Saturday was ***Solar '92*** open day at the NT University and a model solar car race was organised in the car park at the same time. The Department of Mines and Energy used the EnergyMobile as their major form of advertising for this event, by asking to us to hand out their leaflets to the public, and by Bruce mentioning the public lecture when he was interviewed on ABC radio.

All were pleasantly surprised when the lecture theatre was absolutely packed. The enormous public interest was a measure of the EnergyMobile's popularity and that of the sponsor's products on display.

The next couple of days were free, and we had a most pleasant time with Ross Horman and Ross Hortin in Lichfield National Park. There is lots of potential for remote area power systems (RAPS) in these national parks.

Time to get back to Darwin for the Darwin Show. This was a very big show. Three days from 9.00am until 10.00pm! We were situated just inside the main gate, and of the 50,000 estimated people who attended the show, we spoke to about 49,995, (slight exaggeration?). It's very hard not to be excited and enthusiastic when everyone is so impressed with the EnergyMobile.

There was a lovely incident at the show. We were situated next to a gigantic combined defence forces display.

Their air-conditioned marquee had leopard tanks, submarines, missile launchers, etc, and cost about $200,000 to put on show.

They had several million dollars worth of equipment on display. Naturally, the display used megawatts of electricity, and on the first night of the show, there was sudden darkness.

The fuse box in the defence force marquee had disintegrated in a puff of smoke. We felt rather smug to be the only display still operating (apart from the side show ride operators with their diesel generators). We thought that a wonderful essay on renewable energy vs town supply could be written from that example (small is beautiful?).

Ayers Rock

Time to say goodbye to Darwin and the subtropical weather. South with a bullet - or in the EnergyMobile's case maybe a slow arrow. We detoured to Ayers Rock and Yulara. We couldn't go that distance and not claim to have climbed the rock. There are all sorts of warnings at the base of the rock about people having heart attacks during the climb, and after just a few metres, when my heart was pounding in my unfit body, I wondered whether I would make it. I did.

South to Adelaide and an appointment with an ABC camera crew to film a segment for BTN (Behind The News). The children all got dressed up thinking that they would be stars.

It was not to be.

Hours of filming and Travis was featured for maybe five seconds. The result was very good though, and increased the public awareness of renewable energy.

Out of Adelaide and up the hills. We headed to the field days, with a stop at Murray Bridge for a wheel alignment.

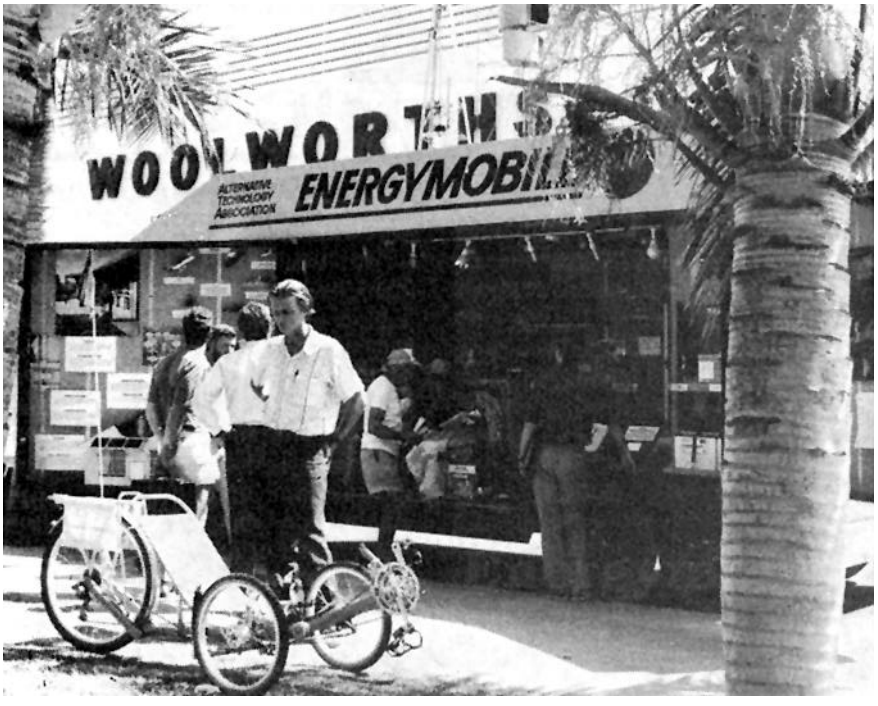
We thought that we would be able to stay at the field day site, as we knew that all accommodation locally was booked out. Not so. This time security said that no-one was permitted to stay on site. Luckily, one of the Country Education Services ladies lived on a large block of land, where we could camp for the two nights.

As it was raining, the children put their tent up in the side of the barn, sharing it with chooks, a cat, numerous mice and a lot of spiders.

By this time, the kids had decided that they were sick of travelling, and the thought of bed in our own home seemed very enticing.

The two days at Speed **were** again busy, and again the EnergyMobile proved to be a popular attraction.

There was a lot of interest in the BP Solar and Solarex RAPS systems and CFLs.



EnergyMobile Sponsors

The ATA would like to **thank the following organisations for their generous support of the EnergyMobile:**

Energy Victoria
BP Solar
Solarex Australia
State Electricity Commission of Victoria
Somer Solar
Selectronic Components
Gas and Fuel Corporation of Victoria
Fortress Industries
Australian Wind Power
Going Solar
Brunswick Electricity Supply
Solarflair
Rainbow Power Company

Home

It was lovely to be finally home again, and it took about 5 minutes to get back into the routine of school and work etc.

The EnergyMobile's maiden journey to the Northern Territory was extremely successful. The EnergyMobile fullfils the purpose for which it was built very well. It is very easy to set up, and makes talking to people very easy.

The interactive displays - the pelton wheel and the switches for the appliance display were very popular. Having a full working RAPS system gives the EnergyMobile credibility. Even our children know a lot more about renewable energy than most children their age, so it was a wonderful learning experience for them.

Chris ***and Bruce McKenzie have been living and working with alternative technology for many years. Their solar and windpowered home is featured on page 9.***

Do-It-Yourself, Low-Cost Double Glazing

One of the weakest points in the energy efficiency of the average home is the window area. The single sheet glass in a standard window is a poor "thermal insulator", and allows a great deal of heat to pass from warm spaces to cooler spaces - meaning, of course, that the house gets cold in winter and hot in summer! One method of reducing heat transfer through glass is to have 2 sheets of glass separated by a sealed air space between them - "double glazing".

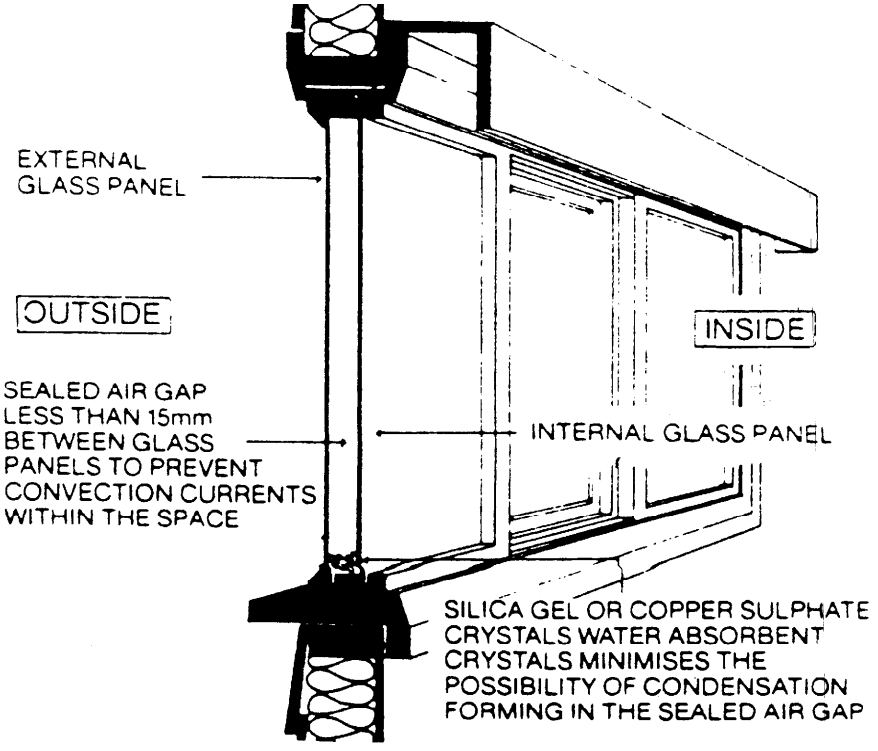
Pre-made double glazed windows are available commercially, but they are expensive and are not as cost efficient for Australia's climate as for colder countries. Similarly, commercial double glazing of existing windows with conventional materials, such as glass, timber and metal sections can be expensive and requires specialist trades people.

On the other hand, home-made double glazing of non-opening window panes can be simple, inexpensive and can be installed by a "home handyman" without specialist skills. Double glazing of openable windows is much more complex and requires more specialist equipment, so costs increase, even if you do it yourself.

Low-cost Double Glazing

These DIY double glazing systems use transparent, flexible, "plastic" films and lightweight frames or fixing devices. They may not be as effective or as durable as commercially available double glazing, but they are extremely effective in stopping draughts from leaky windows or louvre windows, and are much cheaper!

WINDOW INSULATION:
DOUBLE GLAZING



Materials	Suppliers
Plastic film - transparent (Mallanex, polycarbonate, perspex, mylar)	Art, drafting and printing suppliers.
Velcro (hook and eye, self-adhesive)	Haberdashery shops.
Aluminium fly-wire, frame and fittings	Hardware, building suppliers.
Double-sided adhesive tape (heavy-duty)	Hardware, building suppliers.

Double Glazing

Indeed, these systems have been developed especially for Iouvre windows, which present a real insulation headache, as they can never be sealed properly against draughts.

Of course, the other alternative for louvre windows is to remove them altogether and replace them with a new window, but it is an expensive option!

These double glazing systems cover the entire window, thus sealing all air leaks. They can be easily removed if the window has to be opened.

Advantages: Lightweight, simple to build without specialist skills, low cost, seals entire window.

Disadvantages: Not as durable or as efficient as commercial double glazing; may have a drumming effect if not properly constructed or if thin film is used.

Here's how to install two simple kinds of double glazing, one using Velcro, and one using an add-on aluminium frame.

Velcro Tape Option

Materials Required:

* Flexible, transparent plastic film, 0.25mm thick or thicker, *eg. mallanex, polycarbonate, perspex mylar. . .*
* l0mm-20mm wide self-adhesive Velcro (hook and eye) tape
* staples or tacks.

Tools Required:

* Tape measure
* Marker pen or pencil
* Straight edge or set square
* Knife or scissors
* Rags and cleaning fluid
* Staple gun or hammer.

Method:

1. Measure height and width around the outside of the window architraves, or measure the height and width of the window and add 50mm extra for every side, if no architraves.

2 Cut the plastic film to the dimensions measured.

3. Attach the first part of the velcro tape around the edges of the film.

4. Thoroughly clean around the window with soap and water, cleaning fluid, or methylated spirits.

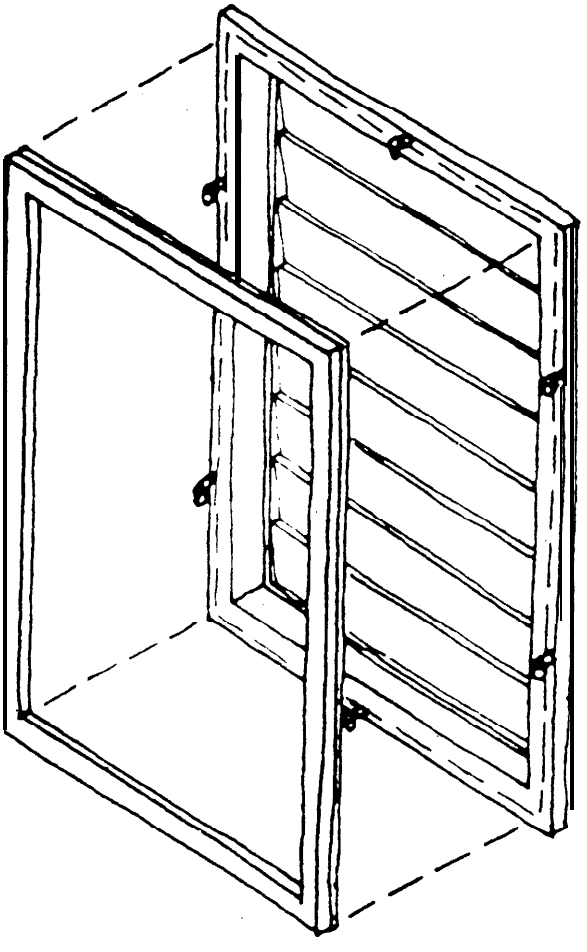
5. Attach the second part of the *Velcro* tape to the architrave or window surround so that it matches with the first part on the film. Staple or tack the tape to the architrave for added strength.

6. Place the film over the window and press Velcro tapes together, while stretching the film.

Aluminium Frame Option

Materials Required:

* Flexible transparent plastic film, 0.25mm thick or thicker, *eg., mallanex, polycarbonate, perspex mylar...*
* Aluminium flywire frame & comer joints.
* Plastic fixing clips and screws.
* Heavy duty double-sided adhesive tape, l0-20mm wide.
* Open-cell, weather-sealing, foam tape (self-adhesive).



Tools Required :

* Tape measure
* Marker pen or pencil
* Straight edge or square
* Knife or scissors
* Hack-saw
* Mitre box
* Hand drill and drill bits
* Screwdriver

Method:

1. Measure the height and width around the architraves and deduct 10mm from all sides, or measure the height and width of the window opening and add 30mm to all sides.

2. Cut the plastic film to the dimensions measured.

3. Cut the aluminium fly-wire frame with a hack-saw and mitre box to the dimensions measured. Fit the frame together with the comer joints. Note: If the unsupported film area is greater than $0.24m^2$, add extra supports to the aluminium frame.

4. Place heavy-duty double-sided adhesive tape around the back edges of the frame. Also put the double-sided adhesive tape on the back of any additional supports as required.

5. Place the plastic film over the double-sided tape and press firmly, making sure that the film is stretched and tight.

6. Adhere the open cell weather-sealing, foam tape around the back edges of the frame.

7. Fit the fixing clips on the architrave or wall just outside the position of the double glazing frame. Fit the double glazing and clip into place.

This information is based on a leaflet prepared by the Brunswick City Council, Melbourne.

Win a Solar Torch

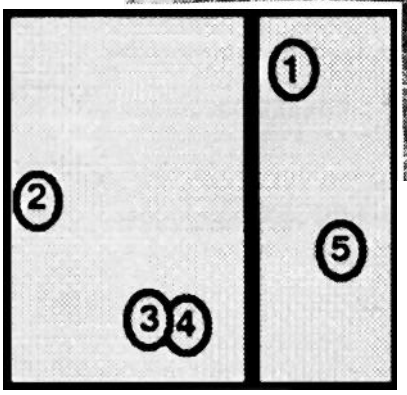
Will the Real Capsicum Please Stand Up?

We here at *Soft Technology* have a deep dark secret. Check the bottom right hand corner of the cover of *Soft Technology 41* (Winter Edition, pictured, right). See that spindly little capsicum plant that nonetheless has five healthy fruit in the middle of winter?

We confess! It's actually a miracle of modern technology!

The designer of our cover scans the photo onto computer - and now we know he can play around with the image as well! One of those capsicums is real - the other four are copies of the real one.

We decided to come clean and at the same time give you the chance to win a fantastic SUNTEK SOLABEAM TORCH. The SOLABEAM is a great new Australian-made, solar-powered rechargeable torch. It gives 50-60mins of powerful light, and will not dim as the power runs low.



For your chance to win, write or ring and tell us which of the five capsicums (1,2,3,4, or 5) YOU think is the original.

The first correct entry drawn will win the SOLABEAM. Entries close on the 10th of February, 1993.

Good luck and happy guessing!
The Editorial Staff, Soft Technology.

Send your entry to:
Capsicum Competition
Soft Technology
247 Flinders Lane
Melbourne 3000
or Phone: (03) 650 7883

Streamlined Cycling:
Faired Recumbent Trikes

We all know that modem transport is a major source ofpollution - but solutions to the problem have not been so easy to see. Now, though, progressive advances in bike technology are bringing the substitution of human powered vehicles (HPVs) for petrol-powered vehicles closer to a reality. In this, the third article by Ian Sims, we discover how a simple fairing can markedly improve the efficiency of the human-HPV combination.

Ian Sims

Last year I was presented with a table of figures *(reproduced, right)* by a speaker at an Electric Vehicle Association meeting. It gives a good idea of the rate at which we are using energy and pumping CO_2 etc. into the atmosphere.

I invite you to imagine what will happen when two billion Chinese move up the lifestyle ladder to our level, and swap their bikes for cars! Goodbye to fresh air, hello to large scale pollution, greenhouse emissions, rising sea level, sickness and cancer!

I don't see much comfort in environmental groups pushing for public transport, electric cars, or solar cars, either. The buses thundering past my door each day with a handful of people aboard can't be more efficient than a full car. Electric vehicles charged with electricity produced at the power station create masses of CO_2, and solar cells require at lot of energy for their manufacture (450kg CO_2 per m^2).

Australia	**16.41**
U.S.A.	**24.1**
Canada	**29.61**
EC.	**22.1**
India	**0.251**
China	**0.161**
Bangadesh	**0.101**
3rd World Africa	**0.101**
South America	**2.51**

Rate of Energy Consumption
Litres of Crude Oil per Person per Day

The Solution

Bicycles on the other hand, need less than $^1/_{100}$ of the energy used by cars, are quiet and non-polluting.

However, they are seen by many people as being slow, hard work, unsafe, and fair weather machines only. I have been working on them for some time now, and I believe I have improved considerably on the ordinary bike with my recumbent trikes. ***(For more detail on Ian's recumbent tricycles, see Soft Technology No. 38. Ed.)***

They are about 20% more efficient, far safer, and much more comfortable than an average bike, especially over long distances. And much more is possible.

I have seen figures indicating that by putting a streamlined covering or "fairing" over my trikes, I should be able to halve the effort required.

At Wayne Kotzur's HPV (Human Powered Vehicle) Challenge in Canberra last year, I had my first ride in a faired trike built by the University of Adelaide. I pedalled to the end of Wayne's street, turned around and came back against a head wind. I got up some speed and stopped pedalling. The trike continued to roll at the same speed, as if I had a tail wind instead of a head wind! I was sold, went home and started constructing a fairing for my trikes. ***(Details, page 28, this issue.)***

It took me two months to build, but the first time I rode it, I found that the trike continued to accelerate for the full length of my street! As other HPV builders had said, "when you get a fairing on it you won't believe the difference!" Instead of a 52 tooth chainwheel, I was now using a 72 tooth one! ***(This means that the bike is in a higher gear. Ed.)***

The Energy Challenge

There was not much time for testing. I had entered the 1992 Energy Challenge and was due in Sydney later that week.

I had intended to use a fibreglass front section and a fabric tail. I was running it fine, but I just managed to weld some tube on to a rear carrier to form a tail framework before I left home.

In Sydney, my rider, Gerry Tatrai, had one ride on it to test it, and then while I used my mum's vacuum cleaner to paint "the nose", she sewed up some sail cloth to form the tail ***(see figure 1).***

The course on the first day of the event, Jan. 21, was a loop through the northern suburbs of Sydney. After Gerry took off from the start at Darling Harbour, it took us 10kms in the support vehicle before we managed to catch him, and at times he was doing over 80kph.

The second day was a loop through the southern suburbs. Despite the heat (up to 40°C) and Sydney traffic, he managed to average 28.8kph over a distance of 153.5km; faster than four of the electric cars, the two solar cars and one petrol vehicle.

The only other HPVs, a Sydney trike, and a Russian trike, both unfaired, averaged just 16.0kph and 11.1kph respectively, and did not manage to complete the course in the very hot conditions.

Testing the Fairing

The NRMA (NSW's version of the RAC, RACV, RACQ, etc.) tried to measure the rolling resistance (see box). At first they produced a 0 - 100kg spring balance, saying "we think it should be about 5kg". I said "If it is 5kg I'll cry!"

So we got a 0 - 25kg spring balance and tried to measure it by towing the HPV around in one of the empty exhibition halls. It was hopeless. As soon as the rope became tight, the HPV would overtake the tow car!

Eventually they took it out on to the road behind the Exhibition Centre and towed it at 60kph. It showed one kilogram on the balance! By contrast one of my unfaired trikes showed 6kg at 60kph.

Back home, I tested them by rolling both down Wheeler's Hill against a moderate head wind. While the unfaired one reached 45kph, the faired one reached 69kph!

As the power required varies as the cube of the speed, this means that the faired one requires only one third the power of unfaired. Thus, even allowing for any inaccuracies, I believe that it would be safe to say that a good fairing will halve the effort needed to pedal the trike.

I also noticed that the tail tended to be squashed in behind the rider by the air, indicating the need for a more rigid tail to recover the claimed 26% extra speed possible with a good tail. Further testing indicted that the fabric tail was worth only 2kph at 45kph, so there is still more to come!

Figure 1. Bird's-eye view of the trike fairing, showing the tail shape and the little windscreen.

Performance

As indicated above, this fairing gives a phenomenal increase in performance. In this machine a reasonably fit person would be able to keep up to an Olympic cyclist on a racing bike. I found that my point to point averages around the suburbs increased from 20kph to 30kph.

I could keep up 40kph on the level with ease. I have yet to test my maximum speed on the level, but expect it to be over 60kph.

Future Developments

In order for them to be seen as more desirable than cars by most of the population, I believe the speed and convenience need further improvement. In an attempt to explore weight reduction, my son, Paul, has built a racing trike with high tensile steel (Reynolds 531) which weighs only 13kg ***(Figure 2).*** He finds that he can crank it up to over 50kph on the level without a fairing!

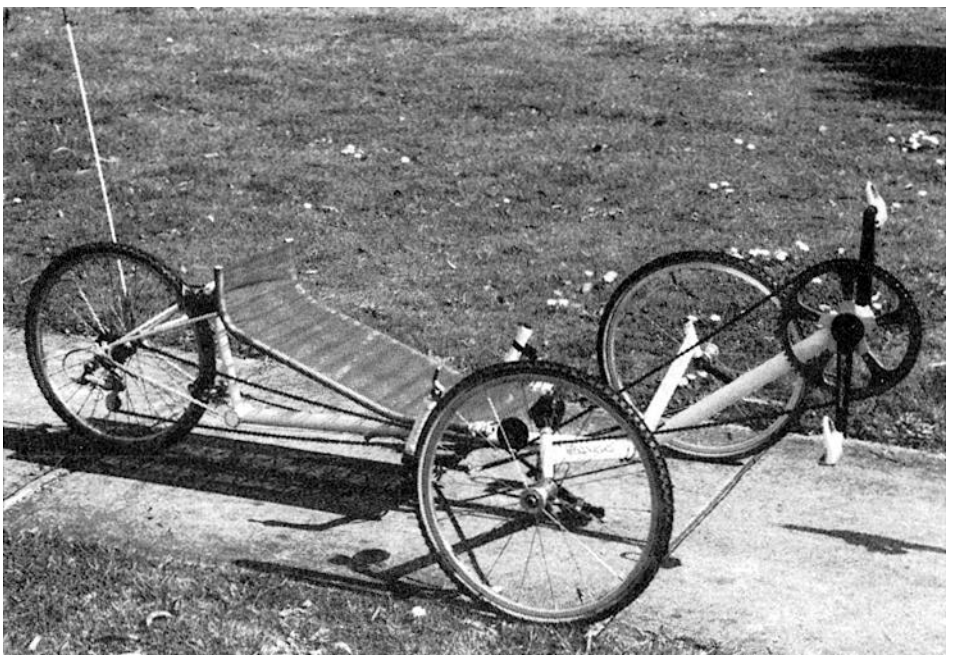


Figure 2. **Paul Sims' racing trike, made from high tensile steel to minimise weight.**

To investigate power assistance I have tried using a small electric motor and batteries. With an extra 200 Watts, it is very nice to be able to pedal up hills in top gear and not have to drop down in speed! I found I only needed the power about 10% of the time, and I guess a small solar array would keep the batteries charged.

On the other hand, I found that with the extra weight of the motor and batteries, I had to use the power up hills I would have cycled up at some speed on the unpowered trike. I also find it more convenient and satisfying to use only my own energy.

The next step is to produce a lighter touring trike, and then work on a fully enclosed fairing, which should reduce the power required to about one quarter of the unfaired trike, and provide complete weather protection. It also needs to have easy access and weigh next to nothing. Ought to keep me out of mischief until the next Energy Challenge!

Since I started building GREENSPEED trikes in April last year, I have built and sold twenty four with Paul's help. With the help of a computer, CAD package and printer, I have also managed to complete the detailed plans. They are available for $100, as well as a full range of special parts for people who wish to build their own trikes. For contact details, look under GREENSPEED in the "At Your Service" section of this magazine.

I would like to thank the Alternative Technology Association and my customers for their support - may our children continue to breathe on this planet!

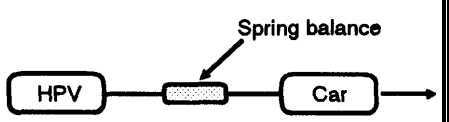
If you would like to know how Ian built his fairing, turn the page!

Measuring Rolling Resistance

Obtain a spring balance of the type used to weigh fish or camping gear. Attach each end to a tow rope. Attach one tow rope to a car, or other towing vehicle. Attach the other tow rope to the unpowered HPV being tested.

Get someone to sit in the HPV ***(don't pedal!).*** Have someone tow the HPV at a steady speed, and read the value on the spring balance. The number of kilograms indicates the amount of wheel friction and aerodynamic drag slowing down the towed vehicle.

If you prefer units of force, multiply the ***kg*** reading by 9.8, and you have Newtons.



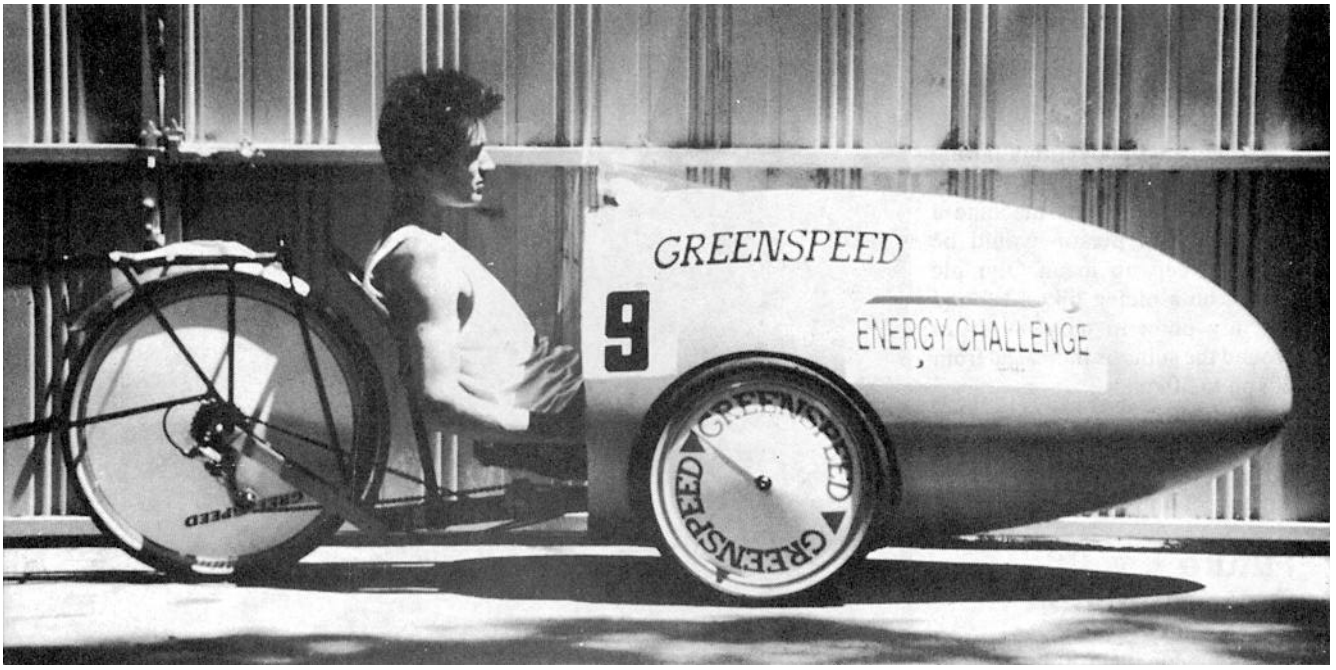


Figure 3. The Greenspeed trike without the tail,, showing the driver position and the shape of the nose.

Constructing the Fairing

For people who would like to build their own HPV, I shall now describe how I built the fairing. For a description of how to build the trike, please refer to Soft Technology No. 38. I had success with a semi-elliptical shape (half a football) nose cone for my electric tricycle, "The Rocket" (Soft Technology No. 29), so I decided to use the ellipse again. Unlike aircraft, land vehicles have a ground plane to contend with, and while some designers try to prevent air going under the vehicle by using air dams and skirts, they do not seem suitable for a practical vehicle. Other designers go for minimum frontal area, and often have the wheels outboard like on "The Rocket". Some others believe that if you include the wheels in your main fairing, your shape is so much better that it more than makes up for the increase in frontal area. Because the track of my GREENSPEED trikes is not too wide, and it is necessary to have a fairly bulky fairing to clear the cyclists' feet and knees as they move, I decided on the latter approach.

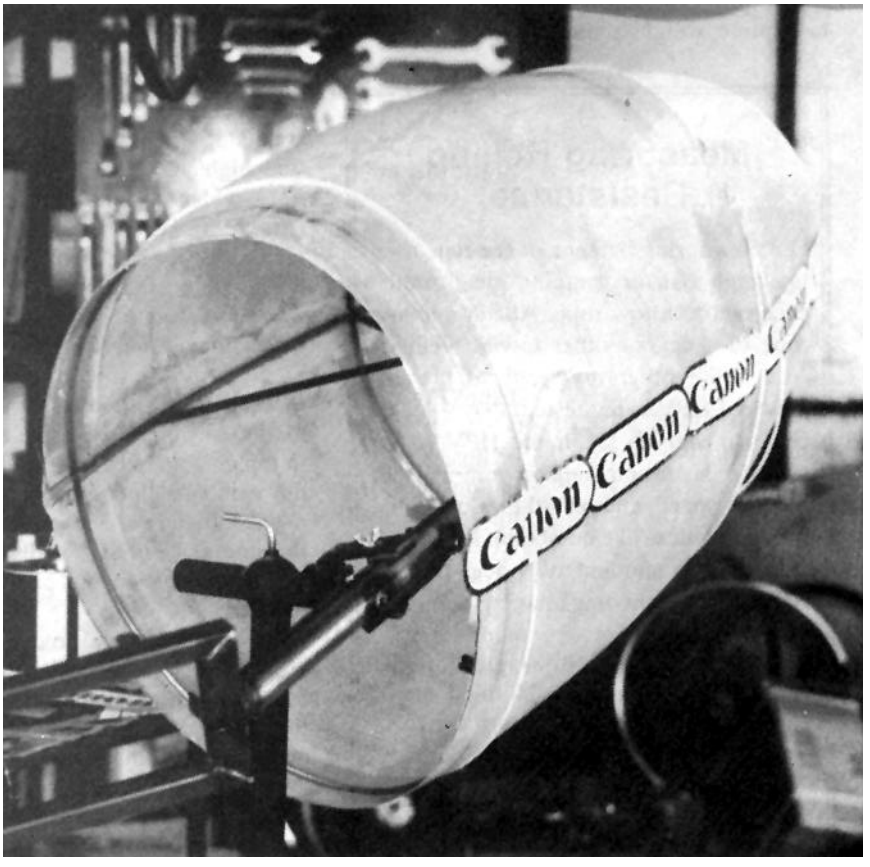


Figure 4. Assembling the fairing nose-cone.

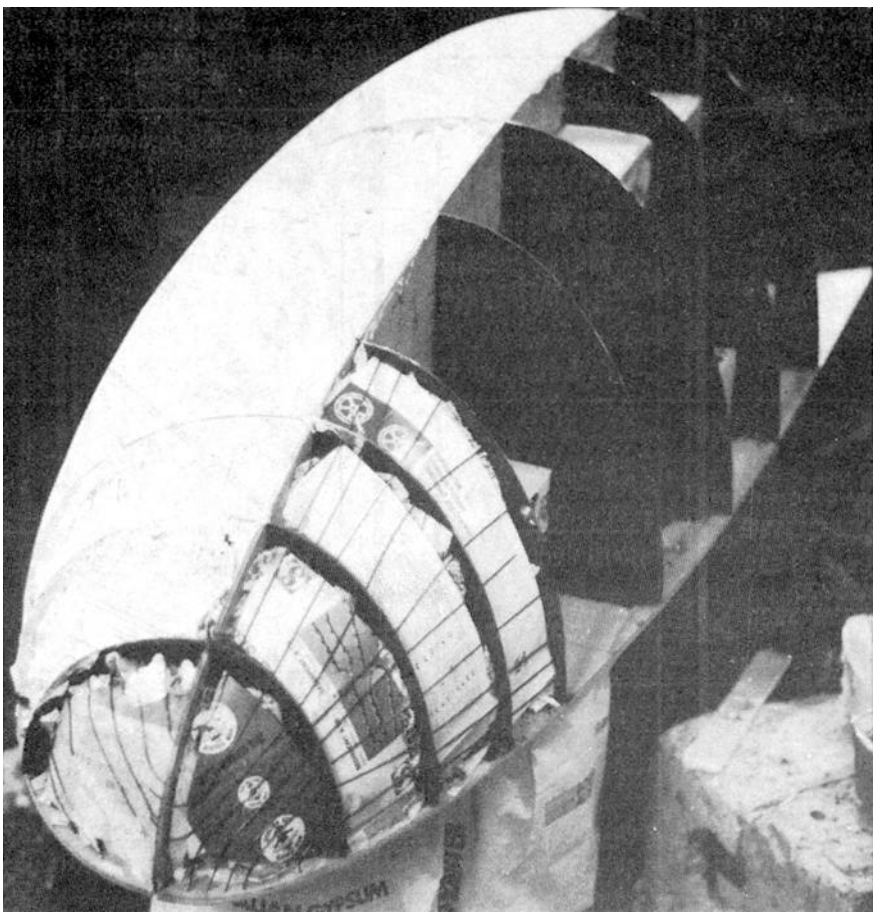


***Figure* 5. Details of the mould construction.**

In plan view, the minor diameter of the ellipse was centred on the front axles - the widest part of the trike - and then the fabric continued the shape back to a point beyond the back wheel, to form a pure "tear-drop" shape (Figure ***1).***

In side view, there are two ellipses: a deep one over the top and a shallow one underneath. Both are centred above the front axle ***(Figure 3).*** In front view, the top "half" is semi-circular, and the bottom again an ellipse.

Two male moulds were made - left and right hand sides. The split down the centre of the vehicle formed the base for each mould. Thus the two ellipses forming the side view were traced out on chipboard, using a piece of string and two drawing pins. Next half the top view was cut out of plywood. Then a number of formers were cut out of Masonite, each having a quarter of a circle for the top "half" and a quarter of an ellipse for the bottom. A cut was made half way down each one, and a corresponding cut made in the plywood former to accept each one.

The whole thing was then fitted and glued together like an egg crate.

The Masonite formers were drilled with 1/8" holes at 1" intervals, 3/8" in from the edge. The spaces between them were filled with old boxes and newspaper, topped off with a layer of cardboard and held in place by 1/16" wire threaded through the holes. Next a mixture of plaster was loaded over the mould and wiped level with a flexible strip of metal (30 x 3mm aluminium strip) touching three formers at once, seen in Figure 5. Once the plaster had dried out, it was sanded using sandpaper glued to a flexible strip of plywood. Two coats of a two pack polyurethane were used to seal it, and four coats of wax and a coat of Poly Vinyl Alcohol (PVAoh) were used as parting agents.

Two layers of thin glass cloth were laid up with polyester resin and rubbed down with more sand paper glued to plywood strips. Despite the care in applying the parting agents, the shell was reluctant to leave the mould, and had to be levered off with a strip of 1/16" ply forced underneath!

Alight framework was make by using one longitudinal hoop and two cross hoops of 5/16" bundy tube (brake line). The two halves of the fairing were taped together over this framework, which was mounted on the trike frame, and glassed on with strips of fibre glass from the inside (see Figure 4).

Cut-outs were made for the front wheels and reinforced with a strip of carbon fibre tape. A strip of Velcro was glued into place inside the rear edge to attach the tail. The tail was sewn up from hang glider sails with a scallop and eyelets at the rear to allow tensioning with shock cord (see Figure 3). A finishing touch was some wheel covers, supplied by Flipt Disc (phone *(03) 331 6324).*

For more information on HPVs, read Ian's other articles on recumbent bikes (Soft Technology No. 37) and trikes (Soft Technology No. 38), available from ATA Publishing for A$3.50ea.

Stop Press:

Ian and Paul have just returned from the 1992 HPV Challenge in Canberra, where GREENSPEED performed very well again. In the standing start races over 1/4 of a mile, the final was held between two GREENSPEED trikes, with the victory going to Paul, on the lightweight trike pictured in this article. He was also second in the hill climb, and third overall - not bad, given that he didn't complete all the events!

Noel's Treasures from Trash

Low cost home science projects showing technology in action

Number 3 in the series in which we delve deeper into Noel Jeffrey's treasure trove of simple and educational gadgets.

Wave Energy Model

Waves are a very powerful source of energy. In Western Victoria, near Portland, they give 35-40kW per metre, enough energy to carve rock formations like the London Bridge and the Twelve Apostles. Here is a little model you can make to illustrate how we can obtain and use some of this power.

How it works.

Waves get higher and closer together when they come towards the shore. As you make waves in your trough they will simulate sea waves going up a sloping ramp, which gets narrower as it goes up and finally empties into a dam. An outlet in the dam takes the water to a water turbine below, which spins as the water runs back to the sea. The turbine, or water wheel, can do all sorts of work.

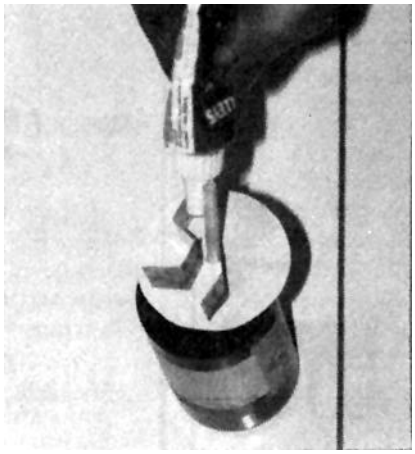


Figure 1. Making the water turbine wheel.

Putting it together

First, make your long narrow trough (so you can make the waves). A fluoresecent light cover is suitable (or something similar). You will need to block off one end by cutting a piece off and glueing it on with silicone (model aeroplane cement), or contact glue. Do the same at the other end, and also glue or fix a piece across the top to provide a base for your dam.

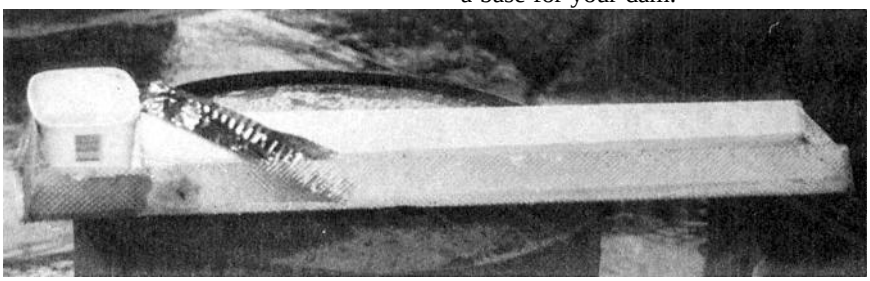
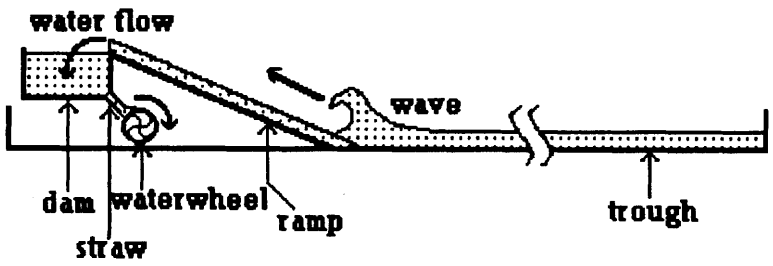


Figure 2. The completed wave generator (above), and a schematic diagram showing the components of it (below).



You will need:

a long shallow trough such as a fluorescent light cover
a margarine container
a drinking straw
a bike spoke or coat-hanger wire
an aluminium tray, (Sara Lee cheesecake, etc.)
Tools: a knife; scissors; a nail

Use a margarine container for the dam. Put a hole near the bottom with a straw to direct the water on to your water wheel. You can use the water wheel described in Soft Technology number 41, but a better one is made from two circles of margarine containers 40-50mm diameter.

Mark the centre of the circles clearly and burn a small hole with a hot nail. Cut some pieces of container of about 20mm times 20mm, bend them in half over a warm knife and glue them to a drinking straw, as shown in the picture. Put the circle down, arrange the pieces, glue and then put the other circle on top (***Figure*** 1). It is easier to do this if you rest the circle on a small jar, so it sits flat, and the straw is held vertical. Use a bike spoke or a piece of coat hanger wire through the straw for your axle.

Make two holes opposite each other in the trough (using the hot nail) for the axle such that when the wheel is installed it does not touch anywhere. Cut your straw so that the wheel is nearer one side.

The only thing to make now is the sloping ramp. Make this from a piece of aluminium like a Sara Lee container. Trim the edges so they are straight. Fold it so that it is the full width at the open end and 20mm at the other.

Tilt the trough so the water is shallower near the ramp end. Fix the ramp with the narrow end up, and secure to your dam. Direct the water from the straw onto the water turbine and make your waves. Good luck!

Model Solar Cars Take On The World

On the lonely stretches of the Sunburn Highway in October next year, vehicles powered only by the sun will slip through the air at speeds in excess of 100km per hour in the Darwin-to-Adelaide World Solar Car Challenge....

Meanwhile, another event for our younger inventors will be run in conjunction with the World Solar Car Challenge. This event, the International Model Solar Car Challenge, will bring together students from all over the world in a special competition to test their model vehicles powered by solar energy.

The Model Solar Car Challenge started in Victoria in 1990. Since then, it the idea has been eagerly taken up in the other states, and even overseas.

The International Model Solar Car Challenge is sponsored by the Department of the Arts, Sport, the Environment and Territories (DASET). The minister of the Arts, Sport, the Environment and Territories, Ms. Ros Kelley, formally launched the event at Scienceworks in the Melbourne suburb of Spotswood on the 28th of October, 1992. The minister was joined by educators and school students in a preliminary race of model solar cars.

All Australian States and Territories are now planning state-based Model Solar Car Challenges in 1992/l993.

The 1992 Challenge

The third Energy Victoria Model Solar Car Challenge was held at Scienceworks, at Spotswood on Sunday I5th, November 1992. The challenge saw entries from 80 schools around the state sprinting over the 100 metre "S" shaped course, powered only by the sun. Speeds in excess of 25kph were achieved by cars whose 8W of available power was generated by a specially designed solar module.

Until 1982, when Hans Tholstrup drove the world's first solar powered car, the Quiet Achiever, across Australia, no-one had seriously considered that solar power could be a viable power source for automobiles. Since then, there have been dozens of solar vehicle races in Australia, America, Europe and Japan.

The winning vehicles in the Australian World Solar Challenge have been able to average speeds of approximately 65kph over the entire 3,000km route.

The concept of a race for secondary student-designed model solar vehicles was borne out of the World Solar Challenge and was made feasible by the support of Energy Victoria. The first two events in 1990/1991 attracted a total of 50 entries from schools from all parts of Victoria.

A strange assortment of designs arrived; some with aerodynamic bodies made of Balsa wood and shrink film, others with their panel tilted to form the trailing edge of an aerofoil section.

Solar Cars

The design of the model cars was constrained by the following regulations. Each car had to have a body 600mm long by 280mm wide, powered only by electricity generated by the sun striking the panel provided.

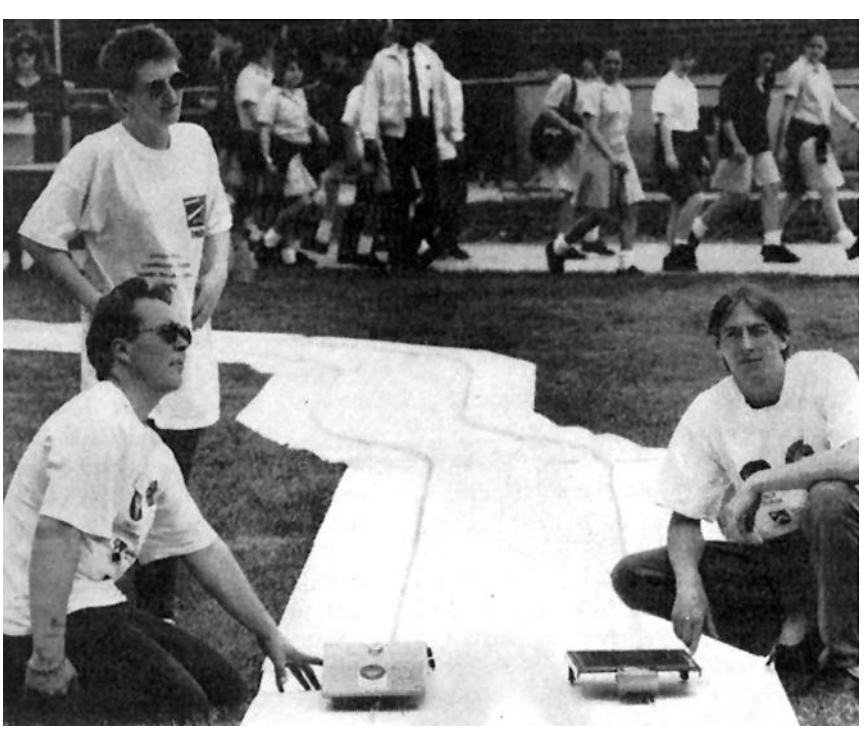
The race was held as a series of drag races between pairs of vehicles fitted with pegs running in a plastic channel on a 70m long chipboard track. The winner of each event continued into the next round, the loser being eliminated.

In the first two years, the event was won by a small community school from Brunswick, Lynall Hall. Their 1990 winning vehicle, "The Beast" was a clear winner, but "Photon", their 1991 entry was closely pressed, beating Swan Hill Technical School's entry by only a few seconds. The pressure was really on in this year's race, but they came through with flying colours to take the hat trick.

The performance of the cars is determined not only by the power obtained from the solar cells, but also by the power lost in the drive train and in overcoming rolling resistance and wind drag. Lynall Hall's successes have developed from a highly scientific approach to the car's design.

Extensive testing of motors, to determine the most optimum gearing and aerodynamic testing in a wind tunnel they built themselves, has paid dividends on race day. As a result, Lynall Hall have already won the Western Region Class' Room Programme Excellence Award and are now entered in the state final.

The 1992 event had more entries running over a tighter and more difficult course. The new track is *Nylex Corflute*, which will overcome the environmental problems of chipboard and will lower the wheel's rolling resistance even further. Solar modules were sent to over 80 schools this year and the competition was fierce.



Sponsorship

The following organisations provided prizes for the 1992 Model Solar Car Challenge:

GMHA
Solarex
Caddsman
The Australian and New Zealand Solar Energy Society
Monash University
Other event sponsors include:
The Department of the Arts, Sport, the Environment and Territories (DASET)
Scienceworks
Nylex
Erni Australia Pty Ltd
Purgon Pty Ltd

Prizes have been awarded to schools on the basis of their performance in the race. In addition, prizes have been donated by GMHA, Solarex, Caddsman, the Australian and New Zealand Solar Energy Society and Monash University to the best engineered car and the best team effort. Additional prizes for the best junior school, best first entry and best all-girl team were given. Scienceworks provided the location for the event, and were also listed amongst Purgon, Erni and Nylex as the event sponsors this year. This year's winners of the major prizes are listed in the box opposite.

As a result of the steadily worsening air pollution problems emanating from the exhausts of millions of petrol-powered vehicles, the world needs alternative fuels and electric vehicles and perhaps the students involved in this event will be the engineers who make such vehicles a reality.

The above information on the history of the challenge was provided by the co-ordinator, Paul Wellington, Mechanical Engineering Department, Monash University, Caulfield Campus on (03) 573 2156.

The committee organising the Model Solar Car Challenge has produced a kit of materials, including a solar panel, for schools interested in getting involved.

For more information, contact:
Dodwell Keyt, Administration Officer
23 Perth Street Murrumbeena
Victoria 3163 Phone (03) 569 0151 *or*
Peter Fries, Project Officer
40 Third Avenue
Coolum Beach Queensland 4573
Phone (074) 46 3089
Fax (074) 46 3089.

The Victors: Lynall Hall

Lynall Hall Community school is different from other schools. It is set up to cater for students who have not had their needs met by the structures and processes of mainstream schooling.

The students, most of whom were enrolled previously in other post-primary schools, have a wide range of needs.

The school's aim is to :
-rebuild damaged attitudes to schooling, learning and life;
- promote learning in basic areas which have fallen behind;

The Winners:

First Prize: Lynall Hall Community School for the third year running.
Second Prize: Korowa Anglican Girls School, first time entrants.
Third Prize: Lynall Hall Community School won this with their entry from the 1990 competition.
Fourth Prize: Wesley College, their first time in the competition.
Most Innovative Car: Jamieson Park School.
Best Engineered Car: Presented and judged by Peter Brock, the winners were Lynall Hall Community school.
Best Junior Entry: Two year eight girls from Braemar College.
Best First Entry Prize: Wesley College

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PHOTO BY DAVID JOHNS

- accommodate the return to formal study of students whose learning has been interrupted;
- assist students whose stage of development or personality has led to feelings of isolation, making learning and social interaction difficult;
- assist students whose talents were not recognised and/or were not being developed.

The Learning Environment

Meeting our students' needs, while laying down the basis for future learning, depends on the provision of a non-authoritarian environment which maximises opportunities to establish and maintain individualised programs and relationships - an environment in which self-esteem and confidence are encouraged and developed.

To this end, the Model Solar Car Project (organised by Monash University and Energy Victoria) has been able to fit neatly into the program at Lynall Hall.

The successes in the three years have been particularly beneficial to the self-esteem of the students and the overall morale of the school.

Solar Cars

Sponsorship

Model solar cars don't come cheaply. Each year the teams brainstorm for potential sponsors and approached them for support in cash or kind. The Lynall Hall team developed sponsor management strategies which required that they actively seek publicity for the project in the press and specialist journals. This year they were able to present sponsors with a commemorative poster.

The following organisations supported Lynall Hall in 1992:

Brunswick Electricity Supply
Brunswick Council:
- Youth Services
Erni Australia Pty Ltd
Purgon Pty Ltd
Ed Credit
Alternative Plastics Pty Ltd

Project Overview

The rationale and execution of the Model Solar Car Project have developed and improved with successive can.

In 1990 the project was something that largely happened outside formal classes. It happened on weekends, at lunchtimes and on school holidays with high levels of student participation.

Because a model solar powered vehicle contest had never been held anywhere in the world, there were no "how to" manuals to which we could turn. We were in a sense at the leading edge of this application of technology. This in itself made students interested.

Upon reflection, a very important learning experience came from the search for information and the search for the best components when trying to design the best car.

We found other people to be the best sources of information. We spoke to an engineering supplier, who told us about another supplier who sold better gears.

We went to the hobby shop, who sent us to the skateboard shop, who had the largest range of bearings.

We found a low viscosity lubricant for the bearings, then we found one better.

Everyone in the group found some information or knew something that was to be useful. At an early stage a recognition of the human factor became apparent.

It was no coincidence then, that when travelling with the *Parhelion* (full size solar car) Team from Monash University (our prize for winning the 1990 event), this human factor became glaringly evident.

This group of highly talented and dedicated people gave Lynall Hall students a privileged insight into what happens when you combine passion with group organisation.

It was the *Parhelion* team model that we tried to emulate in our 1990 team. We made a deliberate effort to give the project a separate identity within the school.

We elected a year 12 student as team manager to oversee the project. We allocated specific tasks to specific groups of students. We had a team name, a team logo, and a team letterhead for correspondence. Each year we try to include younger students who can develop skills to bring to the following year's team.

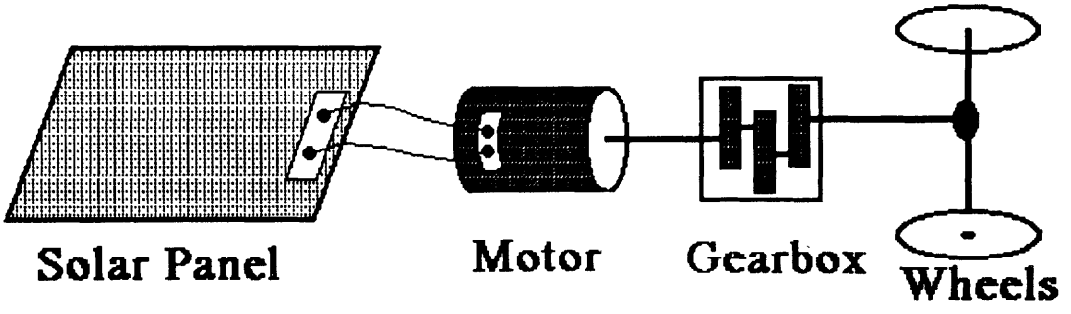
This year the school decided to offer VCE Technological Design and Development for the first time. The solar car project has been incorporated into the study in an attempt to get our most successful educational activity into the regular school program. This strategy has been quite successful with the Tech D and D students each taking *on* an aspect of the design and construction. Younger students in the school will become involved at later stages of production. These students will become the core of future teams.

Design, Make, Evaluate

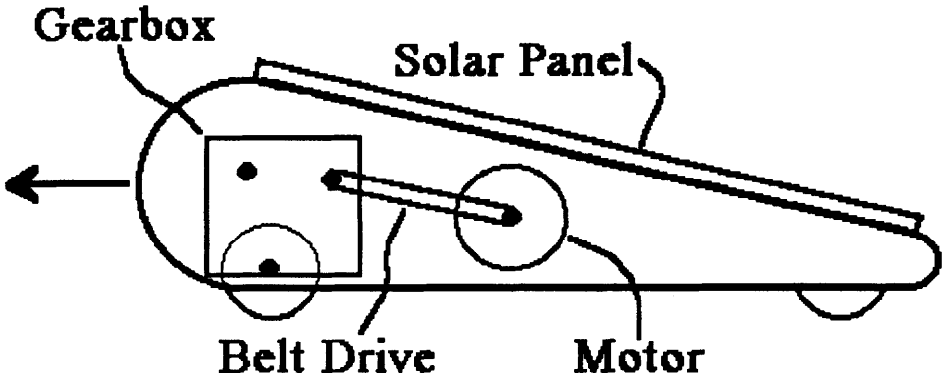
The three fundamental aspects of the project form a continuing cycle. The evaluation of the good and bad points of the 1990 car set the foundation for the 1991 design and naturally the 1991 evaluation gave us direction for our 1992 design. This is how WC approached several components of the design processes.

Aerodynamics

It's very important to have a car that exhibits good aerodynamics and has a low wind drag.



The components of a solar powered car.



The layout of components in 1990's winning entry.

In 1990 we took an educated guess as to the best shape for the car.

In 1991 we wanted to be more accurate, and if possible achieve a better shape for our car. We contacted the Aeronautical Research Laboratories and asked for access to their wind tunnel. It had an F-18 fighter bomber in it at the time and was unavailable for three months. We couldn't wait, nor could we afford the $2000 an hour.

One of the students suggested we build our own tunnel. All we needed was a large fan and a long tube.

We bought a carpet display tube and hired an industrial fan. By building a number of different cardboard models, we calculated drag factors and determined the best shape for our car in what was a powerful classroom activity.

Drag information is crucial in computer modelling the car's race performance.

Motor Selection

Motor selection has in some ways been the most time consuming and exacting part of the process. There are many small electric motors around but how do you compare them?

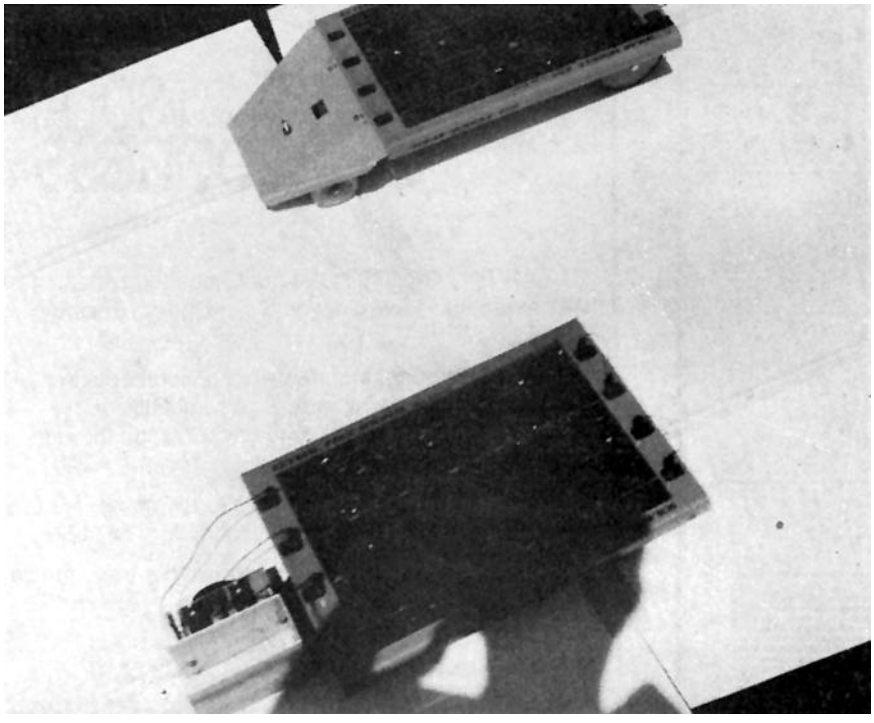


PHOTO BY DAVID JOHNS

We began a process in 1990 of conducting motor tests by lifting weights and timing the lift to calculate power outputs. This technique was refined considerably in 1991. By this simple means we have accumulated reams of graphs and spreadsheets of the performance of different motors under a wide variety of simulated solar conditions. This information is also fed into the computer model.

Computer Modelling

It is not feasible for individual schools to build a 100 metre model race track to conduct tests.

The approach we have taken is to use a computer spreadsheet program to model the performance of the vehicle under varying conditions such as wind speed, luminosity, gear ratio, motor type, car mass and wind drag.

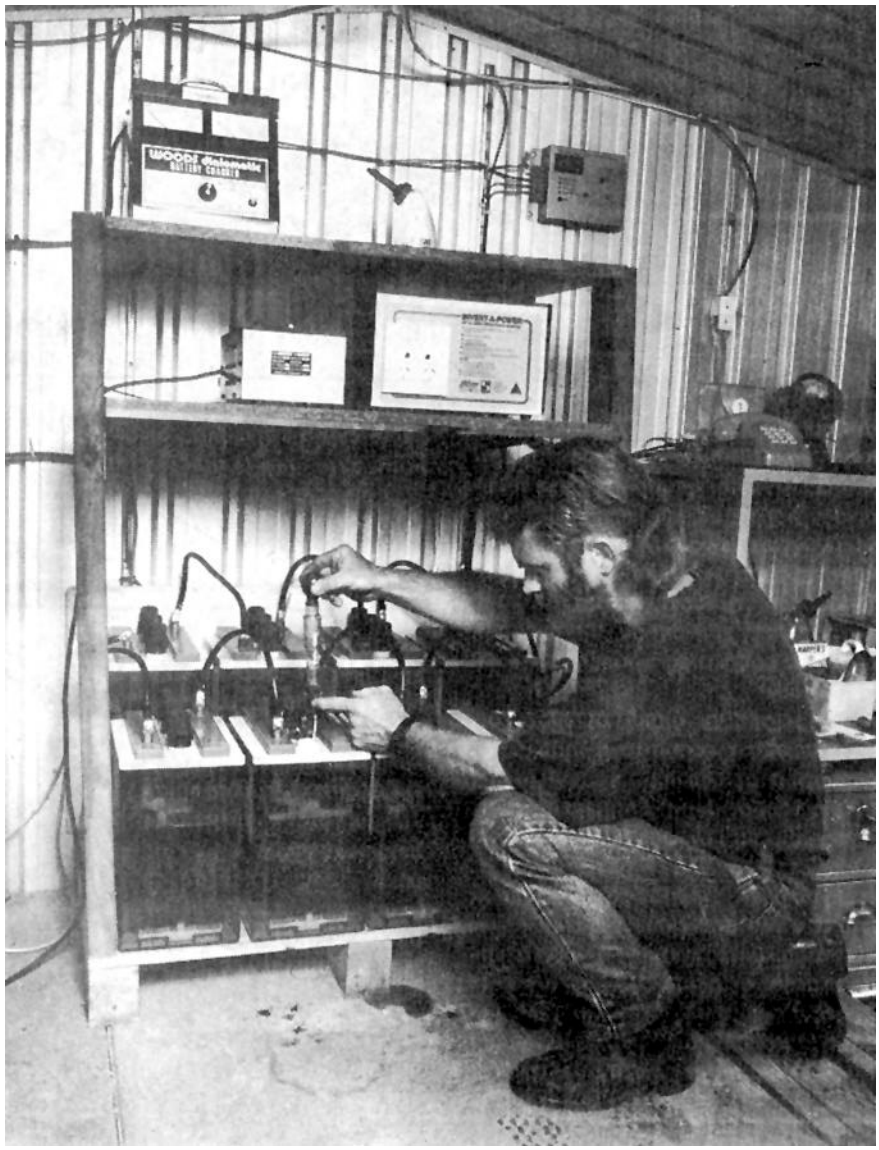
The model was developed in 1991 as a major exercise with year 12 STC Maths students. We used the model extensively during the development of the 1991 car, and on race day. The computer model remains an essential tool in the design process. We hope to keep improving our system and design, and are looking forward to taking on the world in 1993.

The above information was provided by Peter Harley, the teacher co-ordinating the project at Lynall Hall Community School, Brunswick Victoria.

Setting Up A Battery Bank
Important dos and don'ts

Batteries are a vital component of any renewable energy system, and as such, should be treated with respect. Here, David Clarke, of Wind Energy Australia, has put together some valuable guidelines and hints for the beginner.

David Clarke



Using a hydrometer to test the charge of the batteries in the bank

Battery banks are more dangerous than most people realise. When you think about the nature and function of a battery? the danger becomes obvious. A great amount of energy is stored in a very small space, and under certain conditions all of this energy can be released in a very short time, potentially causing explosions and fires.

As an example of the energy they hold, think about the fact that the small. battery in your car can produce enough power to crank over the engine quite easily. If you try doing this by hand with a crank handle, you will realise just how difficult it is! And the battery can produce even more power under the right conditions, and could set fire to the car in a matter of seconds.

Where a large battery bank is used for home power, the danger of fire and explosion is even greater, for two main reasons:

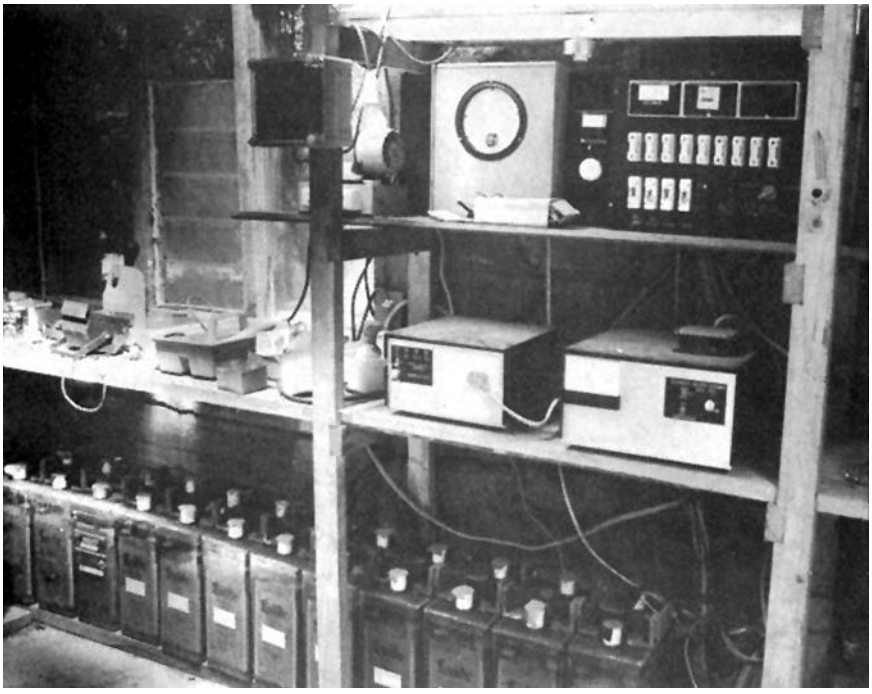
1. the battery capacity is generally larger, often having a higher output voltage, and
2. it often liberates dangerous quantities of hydrogen, (a very explosive gas) at certain times when it is being charged.

For these reasons, it is recommended that the battery bank never be placed inside a house, or under it, or on a verandah.

Whatever the size or voltage of your battery bank, it is worth taking the trouble to set it up correctly.

The battery bank should be in a separate shed used solely for the batteries and the generator. In other words, a separate 'power house' should be built to house the batteries and generator-set. The batteries and generator should be placed at opposite ends of the power house.

Battery Bank



An example of a bank set up on boards on the floor

Over fifty percent of all problems with home lighting plants can usually be traced to some sort of fault in the battery bank. So, when setting up a battery bank, bear the following points in mind.

1. It should be easy and safe to top up the electrolyte.
2. It should be easy and safe to obtain specific gravity readings of the cells.
3. Batteries should be positioned away from other machinery which may damage them.
4. They should be installed in a vibration-free place in which the temperature variation is minimal.
5. They should be placed such that no rain, or any other pollutant, is able to fall on them.
6. They should not be placed on a concrete floor, as the inevitable electrolyte leakage can attack the concrete.

Setting up

When batteries are new, the cases are generally a little flexible, but over the years they can harden considerably and become brittle - another good reason for placing them on a dead flat surface - so that they aren't subjected to undue strain.

If the battery bank is large, it may be a good idea to make up a suitable set of shelves to put the cells on. This is called a battery rack. (The photos in this article show some different battery racks from working home systems.) The battery rack is best made of wood, as wood is one of the few materials which will not be greatly affected by any spillage of acid which may occur. Do not use steel or aluminium to make your battery rack. You can make a neat job of your battery rack by wrapping the wooden shelves in sheets of plastic, and stapling the plastic in position from the underside of the shelf.

If you like, you could even make up a large cupboard for them, with doors a little short at the top and bottom, to allow plenty of ventilation. Many government facilities install batteries in cupboards in this way.

If the batteries are mounted in rows, be sure to allow enough space between the top of one row and the bottom of the next to allow easy access for a hydrometer. About 30cm (12 inches) is a reasonable space.

If you decide not to use shelves but want to put cells directly on to the floor, then put them in a row on a couple of smooth wooden planks that are wide enough to support the entire width of each cell. Sweep all stones and grit off the planks immediately before placing the cells on them, to avoid damage to the bottoms of the cells.

When you have your rack, cupboard, or whatever, carefully place the cells in their correct positions so that the positive terminal of one is touching the negative terminal of the one next to it. In this way, the rows of cells will be connected in series, and the voltages of the cells will be added.

The rows of cells may be connected in either series or parallel, depending on the total output voltage required. If rows of cells are placed side by side, it is very important that there is a large gap between the rows. Occasionally electrolyte can spill from a cell, and if a continuous path of electrolyte can form from one cell to another, it provides a path for the conduction of an electric current, and a "flash over" can occur. This can cause considerable damage to cells and can even cause fires in some cases.

Assembly

Just before you put the batteries in position, make sure that their terminals, which are to be bolted together, are clean. They should be shiny metal, free from oxidisation, and free from grease. You may even have to use a file on them to get them to this state, but the work will be worth the trouble.

When all the cells are lined up, check that the flat faces of the terminals are parallel to each other, so that the maximum area of contact occurs when they are bolted together (some cells bolt together directly, and others use joining straps). In any case, use good quality stainless steel bolts, with flat washers under the heads of the bolts and under each nut. Do all of them up finger-tight at first, then use two spanners, one on the bolt head and one on the nut, to tighten them up.

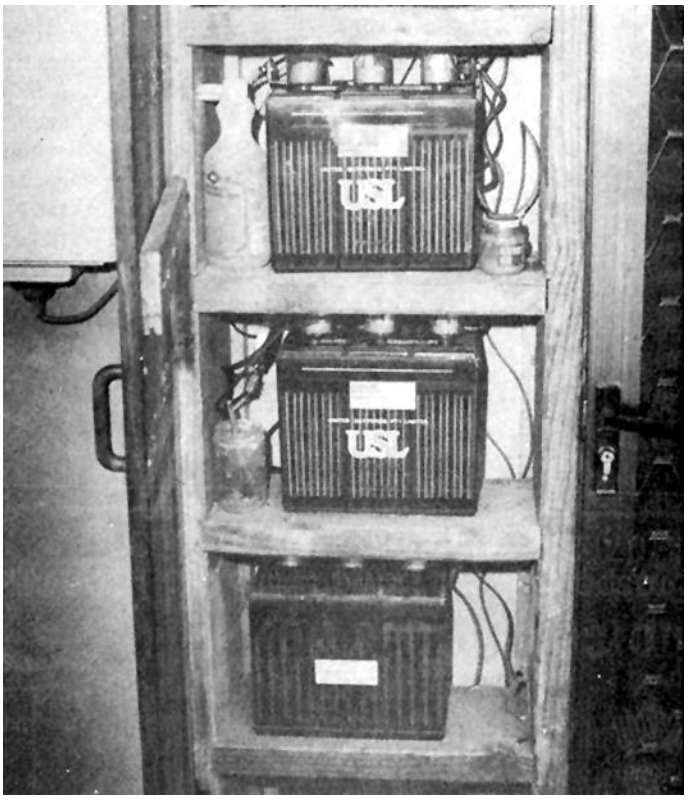
Use the spanners together, so that the force of tightening up the bolts does not tend to push the terminals sideways. The terminals may look strong, but actually they can break off quite easily; so do use two spanners. As a safety precaution, the spanners can be wrapped with insulation tape.

When all the rows are tightened up, it is a good idea to solder the battery terminals together with a small bead of solder across the top, if possible. Remember, these cells are going to stay in this position for up to 20 years, and it is worth taking a little extra time to do a thorough job.

The last thing that you want to happen is for an arc to occur at the join of the cell terminals, especially if the batteries are being charged and giving off hydrogen at the time. A small spark or arc at this point can lead to a major explosion.

Lastly, cover the terminals and bolts with *Vaseline,* to keep air and moisture away from them. This will help prevent corrosion developing between the battery terminals. We have found that one of the major causes of problems in power plants is loose or corroded cell terminals. Periodic inspection and cleaning of them should be carried out whenever necessary, especially if they are not soldered together.

At the end of each row of batteries you should place a fuse with a rating in amps equal to about half of the amp-hour rating of the cells in that row. This often over-looked precaution against fire is relatively inexpensive, and could save you a lot of expense should a short circuit develop anywhere in the system. Remember, even a carelessly placed garden tool may fall across the battery bank and cause a short circuit. It is good to have plenty of fuses in the system, so that dangerous currents cannot flow.



These shelves pack a lot into a small space, but might present a problem when it comes to using a hydrometer.

The leads from the battery bank to the main switch board should be sufficiently thick so that, even when the system is operating at full load, they will not overheat, or give an appreciable voltage drop. It is false economy to use leads that are too thin.

Incidentally, many people are unsure about whether or not it is desirable to connect rows of batteries in parallel. Experience has shown that this is quite permissible, provided the cells are of the same type, and preferably about the same age. Do not mix cells which are substantially different from each other in either age or type.

However, if rows of cells are connected in parallel, it is essential that it be possible to isolate each row, so that tests and maintenance be carried out on each row in the bank individually. For instance, if you suspect that a cell in a row is faulty, then you must be able to operate the system on that row alone while carrying out tests.

Initial Equalising Charge

When a new set of cells are purchased, they are usually supplied in a fully charged condition, and once set up as above should be ready for use. However, they may have been left standing for some months since they were manufactured. If this has occurred, they may no longer be in the fully charged state (all cells, some more than others, discharge slowly by themselves, even if they are not used, due primarily to impurities in the cell material).

It is good practice to give the battery bank a top-up charge before putting it to use. To do this, proceed as follows.

Number each cell from one to however many there are. Make up a chart with the following headings: cell number; initial specific gravity reading; fully charged specific gravity readings; date. Fill in the chart with the cell number and specific gravity readings of each cell.

Now give the bank its initial charge. This should be at a gentle charge rate, - i.e., a rate of approximately one twentieth of the amp-hour capacity of the battery bank (for example, if the capacity of the battery bank is 200amp hours, then the charge rate should be a maximum of l0amps).

Switch on the charging device. If the cells are nearly fully charged, they should start gassing after a few minutes. This indicates they are somewhere between 75% and 100% charged.

If they do not gas at all, you may increase the charge rate to 10% of the amp-hour capacity, until they start gassing.

When they start gassing freely, drop the charge rate back to one twentieth of the amp-hour capacity of the bank, and continue charging the bank for another 2 hours. Then take another set of specific gravity readings, noting them on your chart. If these are the same as the first set of readings, then the bank is fully, charged.

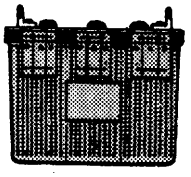
If the specific gravity of some of the cells has increased, continue charging. After another 2 hours, check the specific gravity readings again. You should continue charging and measuring every 2 hours, until there is no change in the specific gravity reading of any cell from one reading to the next.

When this point is reached, you have performed an initial equalising charge of the battery bank. Each cell in the bank should give a specific gravity reading which is very close to the readings for fully charged cells as specified by the manufacturer, and they should not differ from each other by more than a few points. You can now use the last figures of the specific gravity readings you obtained on completion of the initial equalising charge to commence the first page of your battery log book.

Battery Log Book

It is good practice to start a battery log book at the same time that you put a new or second-hand battery bank into service. The battery bank will have cost a considerable amount of money to purchase, and it is an item whose life depends, to a large extent, on proper maintenance. With the use of a log book, periodic readings of specific gravity can be recorded. From these records, you will be able to ascertain whether or not you are maintaining the battery bank properly, and cell weaknesses will show up early. A weak cell generally shows up as a cell whose specific gravity reading gradually gets lower than that measured on the first day of service. By keeping a log book, you eliminate the need to rely on your memory with regard to just how well all of the cells are performing.

If you put some care and attention into establishing and maintaining your bank, your batteries should serve you well for many years. Good luck!



David Clark, of Wind Energy Australia, can be contacted on (03) 773 2935.

Is Your House Paint Making You Sick?

Beware of Cocktails!

Do you suffer from asthma, constant colds or allergic sensitivities? More and more these days, people are questioning whether our created environments could be contributing to these and other health problems. Here, we look at some of the issues surrounding house paint, and what we can do about them.

Stephen Ingrouille

The nature of the beast is such that the more you find out about it, the more you find out there is to know. Even worse, where you previously only suspected danger, you now find mounting evidence that confirms the suspicions!

The beast in this case is modem, petrochemically produced paints, and the effects these paints are having on our health and environment.

Before we go further, we need to acknowledge a number of points: (1) All paints (including the water-based ones) are of concern; (2) some people are allergic to natural products, and of course, some products that occur naturally - lead and snake venom, for example - are very dangerous; (3) Surface coatings (such as paint) play a part in enhancing and protecting the surfaces they cover, and this needs to be balanced against the problems they cause - to the painters, to the people who use the painted products, and to the environment, both during production and with the disposal of residue (containers, rags, old paint, etc).

Many people reading this will be aware that petrochemically produced paints are of concern. The smell gives us a warning. But what happens (particularly in new buildings) when we mix paint fumes with fumes from timber glues, carpet glues, and from plastics and vinyls? Not to mention gases from cooking and heating, and pollution that enters from outside. What we have is a chemical cocktail!

Yet, are we aware how it affects us? The answer seems to be that we are all affected, but to different degrees. For some, it might just be noticing the smell. With others it might be a 'rundown' feeling. We might catch colds more often, or worse, our children might develop asthma. And there are people who just can't live with our twentieth-century chemicals.

House Paints

Dorinda Hancock, who, with her son Sam, is featured in the pictures in this article, painted the entire interior of her house with the Bio Products range of paints.

Initially, it was environmental concerns which made Dorinda interested in these paints. She was also concerned about the effect that ordinary paints could have on the then unborn Sam. As he turned out to have chronic excema, she is particularly pleased with her choice.

She found, as a bonus, that that they were also a lot more pleasant to work with, too. Dorinda said that while they were painting in the summer, they had to close the windows and doors, because the orange blossom scent of the paint attracted the bees!

Dorinda made the point that the professionals who finished her kitchen painting didn't like using Biopaints on the woodwork. The lack of fillers or smoothers means they need more care in application, which is hard on a time limit. On the other hand, they loved the emulsion paint, which they used with a spray gun for the ceiling - it went on beautifully and evenly. Dorinda herself was also very impressed with the Biopaints wood oil she used on her kitchen benches.

I always thought I wasn't overly sensitive to toxic paints. However when I visited a friend's house, which was in the process of being painted, my eyes streamed with water. I asked the painter a few questions:

Had he heard that non-toxic paint was available? No.

Had he read any of the literature on the dangers of paint, published by the Federation of Master Painters or the Painters and Decorators Union? He didn't belong to either of those organisations.

Was he concerned about the strong paint odour? Yes, but he said his body had become 'desensitised' to it.

And therein lies a major problem. Daily, thousands of painters are seriously risking their health. The Painters Hazard Handbook* has identified "five priority health hazards for painters and signwriters":

1. "PAINTERS' SYNDROME"

"Organic solvents get into your body and brain by inhaling the vapours....with years of exposure as a painter, the impact slowly builds up and permanent changes to your brain can result.....Early studies find that painters....show a loss of intellectual and memory abilities....Increased symptoms of forgetfulness, feeling of weakness and unwellness are reported. Mood disturbances eg. depression, confusion, are increased." It would appear that the more a painter is affected by organic solvents, the less aware they become that they are being affected.

2. OCCUPATIONAL SKIN DISEASES

"Contact Dermatitis is caused when your skin has contact with certain chemicals in the workplace. These chemicals make the skin become red, inflamed, sore, irritated, often cracked, dry and itchy and sometimes rashes and blisters may develop....many paints and coatings contain irritants."

3. OCCUPATIONAL LUNG DISEASES

Including Asthma, Silicosis, Lung Irritation, Cronic Bronchitis/Emphysema. "Once your lungs become allergic or 'sensitised' to a lung allergen, the symptoms of asthma can come back with only tiny amounts of exposure....Isocyanates are well documented as Occupational Asthma hazards. Isocyanate vapours can be given off during mixing, during brushing, roller or spray application."

4. OCCUPATIONAL CANCER

"Painters are a high risk group...(The) programme of evaluating chemicals for human cancer-causing potential shows

that a number of substances in paints are known cancer-causing agents (carcinogens)....After all, paints and coatings can be cocktails of many chemicals and painters can be exposed to many different paint products in their working lives.'

5. REPRODUCTIVE HAZARDS

"Should painters be parents?" "Some ingredients of paints and coatings are known to cause damage to the reproductive ability of men and women and to cause birth defects in the children of painters. Of course, the most effective way to avoid birth defects is not to have children or not work as a painter."

The above information is directed mainly at professional painters, but most of us have done some painting - sometimes over a period of months. It may take only this amount of time for these toxic chemicals to start to have an effect. Even if we don't do the painting ourselves, we can still be affected. Paints can 'off-gas' for up to five years after application - which is just about the time when you may need to repaint again.

However, paints are not the sole concern. Many household cleaners are dangerous, as are many of the various chemical glues, particularly timber, cork and tile adhesive, but also glues used in particle board and in carpets.

Scary stuff! But there are some answers. First1 y, make sure your house is always well ventilated. Secondly, choose non-toxic products. By non-toxic, I mean those products especially designed to be sensitive to our health. Even plant-based paints can contain potentially toxic substances, and of course, all such products require the use of chemical science in their manufacture. The difference is in the base materials, the care with which they are used and the aim of the manufacturers. In plant chemistry there are only about 150 base ingredients, and they are substances whose safety has been proven over lifetimes -beeswax and linseed oil, for example. In contrast, there are more than 1000 synthetic ingredients - and little knowledge of their long-term effects on our health. The plant-based paints are sometimes more expensive, but usually just better value: what price do you put on your health?

I recommend the Bio Products range. They have an extensive list including Wall Paint, Enamel Lacquer, Borax (for white ants), Wood Oil & Red Oil, Antique & Hard Floor Wax, Natural Varnish (clear & coloured), Glazing Paint, Japanese Seedlac and Natural Thinner. There are also cleaning products (particularly a Natural Cleaning Emulsion for the floor varnish) and a Timber Glue, Cork Adhesive, Ceramic Tile Adhesive and a natural Paint Stripper.

Livos is another brand of such paints. They have a similar range of products. I haven't used the Livos range, but their "plant chemistry" comes highly recommended by Paul Klymenko, of the Cleanhouse Effect, in Sydney.

As the word spreads, more and more people are turning to the alternatives. People buy them on recommendation from their friends or family. We recommend that next time you need to paint, varnish or glue, try a sample quantity of the Bio or Livos range. When you consider what the chemical paints are doing to your health, the alternative is the quality range of plant-based products.

For more information on Bio Products, contact
GOING SOLAR,
320 Victoria Street,
North Melbourne, 3051.
Phone (03) 328 4123.
For more information, on the Livos range, contact
THE CLEANHOUSE EFFECT, 345 King St,
Newtown, 2042.
Phone (02) 516 4681

*Quoted material is from the PAINTERS HAZARD HANDBOOK, by Noni Holmes, Operative Painters and Decorators Union of Australia

Solar Energy Industries Association of Australia

Solar Who?

The SEIAA is a national organisation which encompasses the Renewable Energy Industry and which is working towards a more sustainable future from an economic and environmental viewpoint. The association is in its fifteenth year of operation. It comprises a cross-section of the industry. The majority of members are companies, businesses and individuals who are actively involved in deriving an income through their role in the renewable energy industry.

The association also consists of government bodies, energy producers and utilities, academic institutions, research and development organisations and members of the public who share the same ideals.

The founding principles of the SEIAA are to stimulate maximum utilisation of renewable energy in the Australian environment and to lead the world by example into a solar oriented society, through links with similar international associations.

The SEIAA is concentrating on the following areas:

- **providing a forum for renewable energy**
- **allowing exchange of views**
- **developing guidelines, standards and regulations which provide consumers and users with acceptable products**
- **establishing policies, both legislative and administrative**
- **fostering the growth of the industry and increasing public awareness in Australia.**

SEIAA members are involved in the following areas:

- **solar pool heating**
- **passive solar heating and cooling**
- **wind energy**
- **hydropower**
- **photovoltaics**

For more information, contact: The National Secretary, SEIAA, 247 Flinders Lane, Melbourne, 3000
Phone: (03) 654 1489, Fax: (03) 650 4175

Solar Energy Industries Association of Australia

Membership Subscriptions 1991/1992

Company Name:_____

Address:_____

_____ Post Code: _____

Commercial Activity:_____

Contact Name:_____ Telephone:_____ Facsimile:_____

Membership Categories (please tick)

☐ **Full Member: $150**

Any business whose annual sales are derived from the sale and/or installation of solar/wind/thermal or anyother renewable energy components or systems.

Full membership is expressly open to :

* solar appliance, equipment and component manufacturers and wholesalers (including overseas manufacturers);
* material suppliers to the renewable energy industry;
* solar appliance retailers and installers.

NOTE : SEIAA members comply with a Code of Ethics .

☐ **Associate Member: $60**

Any interested organisations and members of the public wishing to be actively informed of Australian renewable energy industry activities.

Associate Membership is open to :

* government bodies (Federal and State);
* solar research and/or development organisations;
* professional engineers, architects, tradesmen;
* members of the public;
* energy producers and public utilities.

An Associate Member has no voting rights.

Please complete and return to: **The National Secretary, SEIAA, 247 Flinders Lane, Melbourne, 3000** or fax to (03) 650 4175 or call (03) 654 1489.

Transport: Hard and Soft Options

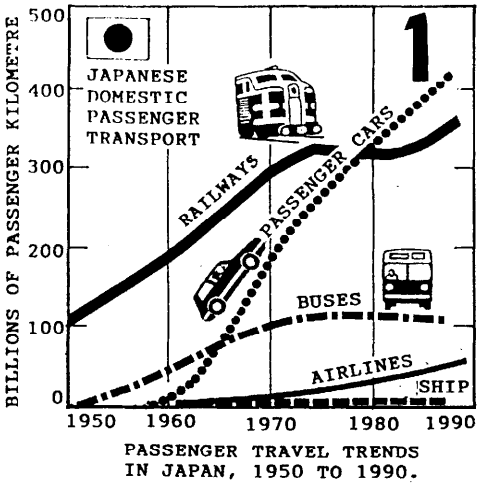
Research and Graphics by Alan A. Parker

Written by Suelette Dreyfus

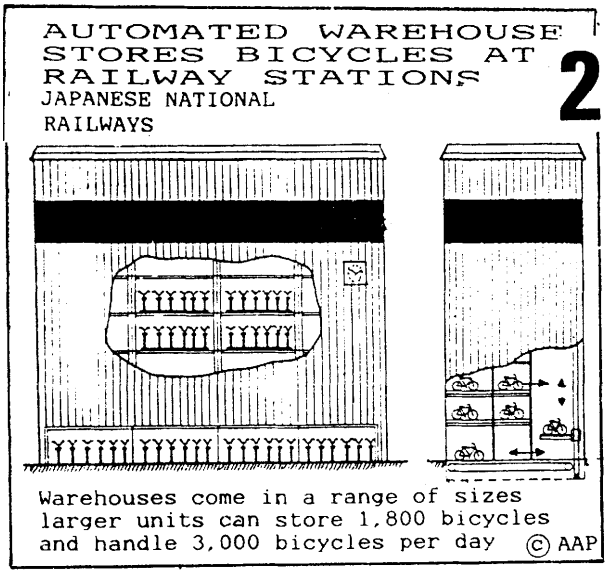
You see the strangest things in suburban Japan. Hordes of businessmen, pedalling along the footpaths to the nearest railway station, and storing their bikes with up to 1499 others in huge automated warehouses in the space over the stations. And remember the local Aussie pedal-powered policeman of yesteryear? He is alive and well in Japan: 60 000 police ride bicycles!

Japan, like Holland, is a place where the bicycle is an important means of transport. And with bicycle sales in Japan holding steady at about 8 million per year, soft transport technology dearly has a bright future.

More importantly, the Japanese have been very innovative in the way they have made best use of passenger vehicles, and their cities are models of efficiency. (Graph 1 shows the high level of rail and bus use in Japan over 40 years.) For many Asian cities with nightmare traffic systems, like Bangkok and Taipei, the Tokyo transport system is something to strive for. While Australia has fewer traffic problems than these Asian cities, the Lucky Country could take a few lessons from its Japanese neighbour.



PASSENGER TRAVEL TRENDS IN JAPAN, 1950 TO 1990.



In Australia, cities have sprawled ever outward trying to feed the voracious appetite of The Great Australian Dream - the quarter acre house block. in Japan, regional centres have been concentrated around train stations, so residents don't have to drive cars into the Big Smoke. Australian companies give cars to employees - and usually throw in free petrol and parking for good measure. Indeed, Australia has about 2 million company cars clogging up freeways and city streets. By contrast, Japanese companies give free yearly rail tickets to employees. In Australia, drivers are rewarded for parking in the city more rather than less often; casual users of city car parks pay much more in daily fees than monthly ticket holders pay. Fines for illegal parking are aggravating, but not extortionate.

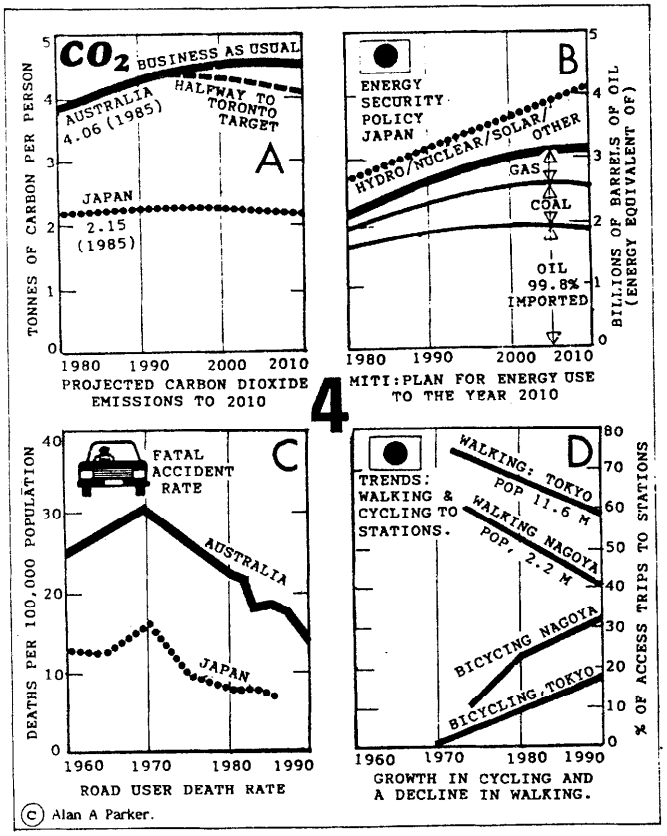
The Japanese, on the other hand, do a lot to reduce the number of driver-alone car trips to and from work. If you want to drive into work in Osaka and Tokyo, you pay a lot more than $4.50 per day in parking fees. Before you can even register your car, which costs A$l,000 per year, you must prove that you own or permanently rent a parking space. Buying a car parking spot in downtown Tokyo costs slightly less than the average Australian home - about A$l00,000. If that is a little out of your price range, you could always rent a space for about A$550, if you are lucky enough to find one.

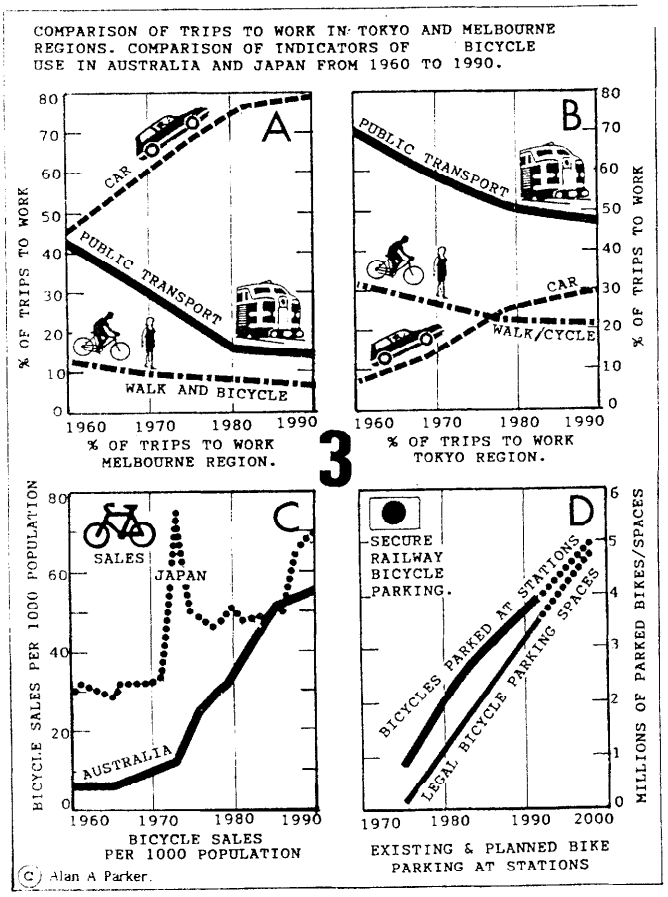
Still interested? There are a few more hoops to jump through. You'll have to sell your car every few years and buy a new one, just to comply with the Government's long list of stringent regulations discouraging the use of old cars. Fines for illegally parked cars are massive, up to A$2,000. Japanese petrol prices are twice as high as Australian prices, and road tolls cost about A$25 for a one way, 100 km trip between cities. It all adds up to a pretty big stick, but there is also a carrot. In Japan, the carrot is the efficient and effective public transport system and, most relevant to Australia, making it easy to use bicycles to access rail stations in the outer suburbs.

All of these policies and regulations stem from one key difference between Australia and Japan. Australia has relied on so-called market forces to determine how many people own and drive cars. Japan has taken the matter in its own hands and actually planned how the majority of its citizens will travel to and from work.

The results speak for themselves. In Japanese cities, 15% of workers pedal to the office or the nearest commuter train stop each day. Hundreds of thousands of commuters combine a bike ride with a train trip to get to work. By the turn of the century, it is expected that there will be more than five million bike-rail commuters. (See Graph 3, a,b,c,d). In fact, today only 30% of Tokyo commuters drive to work - a statistic that present day Australian transport planners can only dream about. And those drivers are doing less damage to the Earth's climate than their Australian counterparts; the Japanese car fleet is significantly more fuel efficient per passenger kilometre than the Australian fleet. Their transport system is also put together is a way that makes better use of the car, bus, train and bicycle fleets.

The Japanese learned early that a long-term transport strategy would benefit everyone through cleaner air. During the past 20 years, air pollution levels, which used to be far worse than Sydney, have dropped in places such as Tokyo and Yokohama; and the availability of high-quality trains and the development of new cities along rail lines have been the cornerstones of that success. By comparison, Australian cities have little to brag about. They churn out more pollutants and carbon dioxide per person than most other cities in the world.

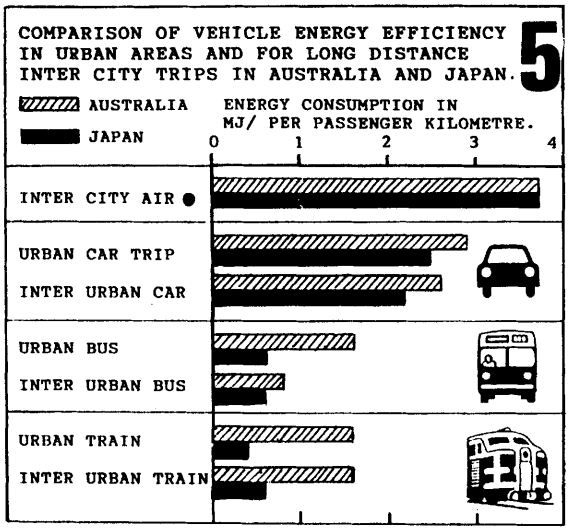




Japanese cities of comparable size have some of the lowest emissions per head of population in the industrialised world. In fact, the average Japanese person produces one half the carbon dioxide, the dreaded Greenhouse gas, as his or her Australian counterpart. Japanese per person CO_2 emissions are not expected to rise before the turn of the century, (and will then drop, as shown in graph 4a) yet Australia emissions are growing by 2.5% each year.

Clean air is only the beginning of the good news - the results of the Japanese Government's transport policies read like a politician's wish list of good news stories. While the Japanese have been cleaning up their air with good transport planning, they have also saved citizens' lives, made the nation's products more cost-competitive, and reduced their dependency on imported oil. Japan has one of the lowest road tolls in the world (see graph 4c) - people are too busy catching high-speed trains to drive into one another. Needless to say, Japan's high-speed rail system has a flawless safety record -not a single fatality in 27 years.

The Japanese also understand that high transport costs add to the cost of the nation's goods and services, and this in turn makes the goods and services less competitive in the international marketplace. Further, during the 1973 world oil shock, they learned that it can be a very expensive proposition to be heavily dependent on foreign oil. While countries like the US and Australia bounced back into their oil-



consuming lifestyles after oil prices dropped, the Japanese decided to defend themselves against such a tenuous position in the future. The Japanese Government introduced the National Energy Security Policy, an aggressive program to reduce the country's dependence on oil, 98% of which was imported. The policy's long term objectives are shown on graph 4b.

The reasoning was simple; reduce the amount of energy used to produce a good or service and you will reduce the cost of product, and probably reduce the country's overall dependence on oil. All over the Land of the Rising Sun, Government and industry developed strategies for cutting oil use in factories, offices and power plants. But the plan didn't stop at the factory gate - officials realised that they also needed to account for oil used in transporting their workers to and from home. This realisation helped launch one of the most successful transport systems in the world.

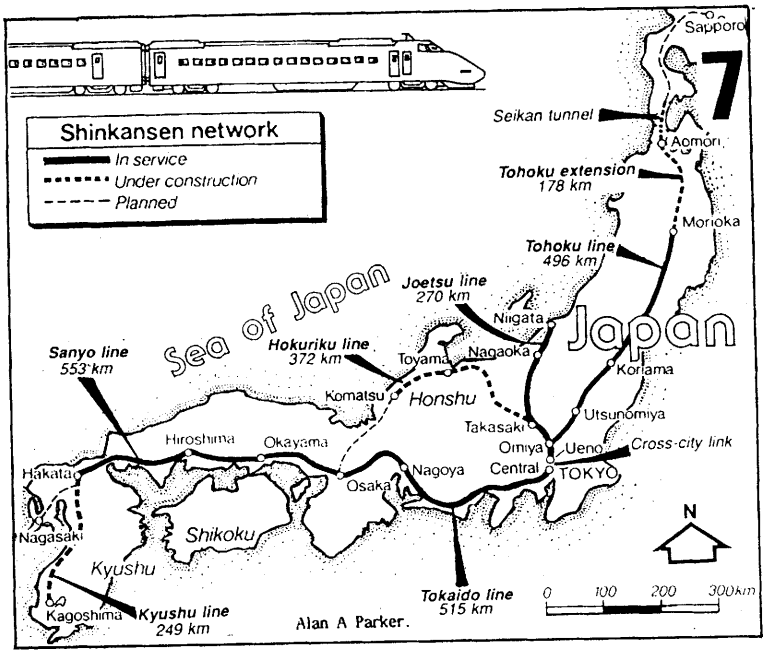
Calculated on a per person basis, the Australian workforce uses three times as much petrol to get to city offices and factories as the Japanese labour force. And it gets worse. Japanese bullet trains not only out-run our sluggish suburban track-crawlers, they are also more energy efficient per passenger kilometre travelled. But our suburban trains are in good company - all forms of motorised transport in Australia are less energy efficient. (See bar chart 5.)

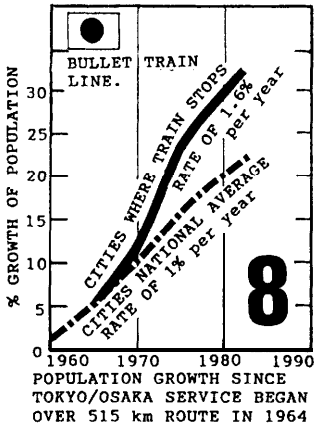
The Japanese are so holistic in their approach to transport economics, they even account for the amount of energy used to manufacture trains and cars. Per passenger, it takes a lot less energy to build a suburban train line than it does to build a road. Estimated on a per passenger kilometre basis, public transport vehicles use about five percent as much energy to build as cars. This sort of analysis is very important for society to choose the best transport options for the economy as a whole.

The Japanese success story did not happen overnight. It took years of planning and a good deal of patience from the average Japanese citizen. In the 1970s, when Japan began its aggressive policies to encourage energy efficient transportation, the country was in a period of rapid growth and prosperity. Japanese housewives living in outer suburbs needed to get to the market to shop and do other chores. Encouraging a housewife to lug her shopping around in the front basket of a bicycle would certainly have posed a daunting challenge, but Japan had one ace up its sleeve. Few people owned cars in Japan in 1970, (compared to Australia for example) so the Japanese Government only had to encourage people to keep using their bikes, rather than asking them to give up their cars.

The best way of motivating people not to buy cars is to give them good, fast alternatives for getting to work. One way of encouraging people to ride bikes, is to provide a safe place to lock them up. The Japanese Government has invested A$3.5 billion in secure storage facilities for bicycles. It has also made sure that bikes are widely available. There are bicycle hire facilities at most rail stations in tourist and industrial areas, where shift workers use pedal-power to get home after the trains and buses have shut down for the night. The trend is to walk less to stations, and as there is no parking for cars, bicycle trips to stations continue to increase. Graph 4d shows the 20 year trends for the cities of Nagoya and Tokyo.

Another way is to encourage motorist to be courteous to cyclists. Some 60,000 police patrol officers in Japan ride on bicycles, which undoubtedly improves the road manners of drivers. In addition to promoting good manners, the local pedaling police force can get to calls much faster on bikes than in cars.





For longer journeys, the Japanese have developed some of the best train travel in the world, and they have 2000km of high speed rail lines in use: and they have made money out of the deal! Zooming along at 240 kmph, bullet trains make for a speedy trip to the office - and good profit margins for their operators. In 1987, the Japanese National Railway was privatised and split into six companies, all of which are profitable, and the bullet trains are the jewels in the crown of this industry. These trains are the big earners.

The Japanese realised that they are not in the rail business - they are in the transport business. That means that they must always keep improving the quality and speed of their trains in order to compete with other transport options, such as air travel and truck transport for cargo. And they have improved - and improved some more. When the bullet train between Osaka and Tokyo, two of Japan's biggest cities, first opened, the journey took four hours. As a result of improved technology, it now takes less than three hours - and has nearly wiped out the competing air service between the two cities. Two of the Japanese rail companies have developed new high speed trains which will run at more than 300kmph, and one other company is planning a magnetically - levitated train which will glide down a special track at more than 400kmph. Small wonder that people want to ride a train instead of drive. (Japan's plans for it's high speed rail system are shown on map 7, page 51.)

While progressive transport planners wax lyrical about the wonders of Japan's transport systems, Japan has developed its world class system out of necessity, not altruism for the world's air pollution problems. The Land of the Rising Sun is in fact The Land of the Rising Mountains, and little of the country's land is habitable. Only 15% of the island nation's land is arable, and so space is at a premium. The Japanese Government has been forced to practice good town and transport planning in order to fit 125 million people around 160 volcanoes in an area less than one and half time the size of Victoria.

This brings us to the greatest Japanese achievement of all, which is using rail lines as the focus of new urban growth to reduce growth rates of the biggest cities. By the year 2000, another 1200km of high speed rail lines will be built and new urban development will be concentrated along the 3200km of these lines. The reason for this was the early growth of cities along the bullet train route from Tokyo to Osaka (shown on graph 8). Decentralisation is made possible by rail-linked cities. Most short-haul, energy-wasteful air flights will be eliminated and the use of single occupant cars for inter-city travel will be greatly reduced.

With a seemingly endless supply of wide open land and a national population smaller than the population of greater Tokyo alone, Australia will not be forced into good transport planning by something as rigid as nature. Yet, Australia's poor transport system is economically and environmentally unsustainable. Australia could easily develop a national strategy to increase the number of people who cycle or ride the train to work and discourage people from contributing to urban sprawl, by increasing the price of land in outer suburbs. Better still, Australia could build its population along a high-speed train route running from Brisbane, through Melbourne and Sydney, to Adelaide. It has worked in Japan - why not here, too? Food for thought!

Suelette Dreyfus is a Melbourne-based freelance environment and energy journalist.

Alan Parker is from the Town and Country Planning Association, 50 Stirling Street, Footscray, Vic 3011. For those who would like a more detailed analysis, Alan's research paper, Alternative Transport in Japan: an Energy Conserving Mix of Hard and Soft Technology, is available for $5.00 including postage, from him, at the above address.

Behind the Scenes

ATA Goes National

Big News! In the past, the Alternative Technology Association, (publishers of Soft Tech.) have been confined to the deep south and far east, (Victoria). As a result, our meetings, courses and other activities have been of little use to people in other states. That's meant that "Behind The Scenes" has had limited interest to those of you in the warmer states, (or colder state, in the case of Tassie).

That is all about to change. Over recent years we have received increasing numbers of requests from members and subscribers from around Australia wishing to have local groups. People have been keen to have a forum to get together to exchange ideas and information for mutual benefit, or to work together on practical projects.

New South Wales

So in early November, the first interstate group started, with the first New South Wales newsletter and activities.

Over period of a week, the EnergyMobile went on display in Canberra, in Darling Harbour in Sydney, and even in Wollongong. All our NSW members and subscribers were invited to come over for a look.

We also held our first meeting in Sydney with Dr. David Mills, and Tony Monger talking about the Sydney house that has been retrofitted, in conjunction with Pacific Power, to improve its energy efficiency. We also toured APACE's hydro power test facility and heard Bruce McKenzie speak about his experiences in outback Australia with the EnergyMobile.

The meeting was a great success and a core group is forming in NSW to organise activities for 1993. If you would like more information contact Geoff Tory on (02) 981 4536 (h).

Other States

Early next year we will be contacting subscribers and members in other states to see if you would like to organise something locally. Stay tuned.

The EnergyMobile Is In Demand.

Meanwhile, some good news on the EnergyMobile. The Department of Primary Industry and Energy in Canberra have decided to lease the vehicle to assist with the promotion of RAPS, (Remote Area Power Supplies) in Northern Australia. In the process of getting to and from Northern Australia we will pass through all mainland capital cities. So almost everyone will have a chance to see the Energymobile live.

Back at the Office

We have some new helpers. Maria, Tiziana and Nikki have been assisting with the many tasks that it takes to keep things running smoothly. We have also been joined by Margaret who has been busy beating the subscription records into submission.

Speaking of help, has anyone out there got access to a second hand, but good, fax machine and/or commander phone system? With all this new activity, we are feeling the need for some better communications equipment! We can afford some money, but not the price asked for new machines. Please ring us on (03) 650 7883 if you have any ideas.

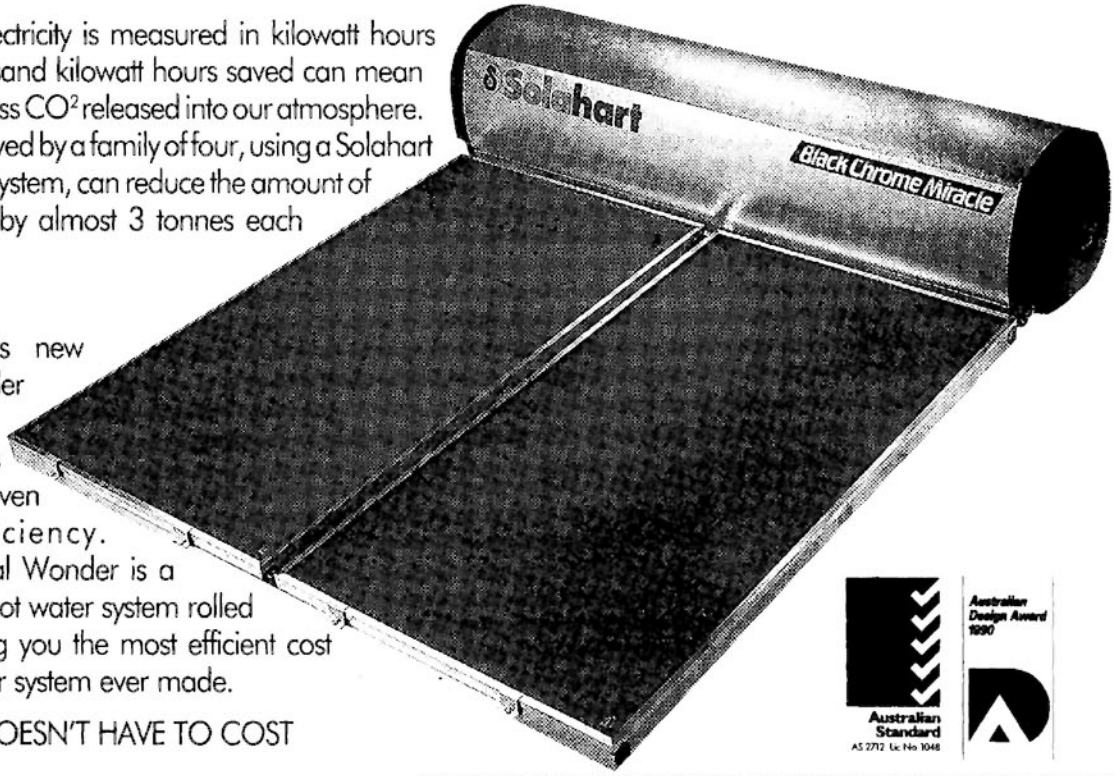
Solar Energy Industries Association

The ATA is now providing administrative services for the Solar Energy Industries Association. We recently realised that the roles of the two organisations had complementary aspects and hence the new arrangements. In the near future the SEIAA hopes to have its own executive officer helping to develop the industry to its full potential. The new phone number for the SEIAA is (03) 654 1489.

Nikki, Tiziana and Maria (left to right)- new and very welcome additions to our happy band of volunteers

SOLAHART
REDUCES 3.5 TONNES OF CO^2

Here's how! Electricity is measured in kilowatt hours and every thousand kilowatt hours saved can mean a whole tonne less CO^2 released into our atmosphere. The electricity saved by a family of four, using a Solahart solar hot water system, can reduce the amount of CO^2 emissions by almost 3 tonnes each year.



GAS OPTION
Now Solahart's new Natural Wonder gives you the option of gas boosting for even greater efficiency. Solahart Natural Wonder is a gas and solar hot water system rolled into one. Giving you the most efficient cost saving hot water system ever made.

HOT WATER DOESN'T HAVE TO COST THE EARTH
Solahart provides a year round supply of piping hot water. Most of it heated free by the sun. Plus your Solahart comes with a 5 year warranty with the option on some models to extend up to 15 years. All of which adds up to big savings for you and the environment.

Australian Standard
AS 2712 Lic No 1048

Australian Design Award 1990

FREE INFORMATION BOOKLET

If you're thinking of buying a new hot water system, phone our free call number and ask for your FREE BOOKLET - " HOT WATER DOESN'T HAVE TO COST THE EARTH" to be sent to you obligation free.
Phone James Hardie Customer Service weekdays 8am - 5pm
008 021 321 (free call) or send this coupon to:
Solahart Australia, Block "S" 3/391 Park Road, Regents Park. NSW 2143.

Yes, I wish to receive a free copy of "Hot Water Doesn't Have To Cost The Earth":

Name _____

Address _____

_____

_____ Postcode _____

Phone _____

Solahart
Hot water for life

Solahart Australia
Block "S" 3/391 Park Road, Regents Park NSW. 2143.
Telephone (02) 743 8900. Facsimile (02) 743 8929.

Hardie Energy Products Pty Limited
A James Hardie Company

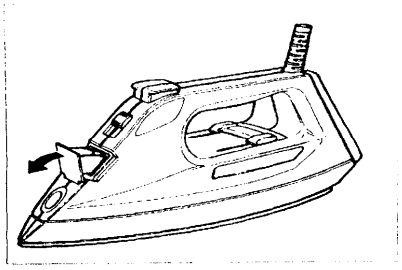
THE ALTERNATIVE 2754

Products

Ironing out a few problems

Kambrook have come up with the K1600 iron for people who forget to turn things off. If left horizontal on the ironing board, it turns off in 7 seconds. If left in the upright position, it will go into resting mode, cutting its power use from 1200 to 40 Watts, and then after 7 minutes will shut down. The K1600 retails for around $85. The less expensive Kl500 iron has the energy saving resting mode, but not the horizontal shut off. Both irons are made in Australia.

For more information, contact the Kambrook seconds shop, 176 Barclay Street, Footscray, Victoria, ph: (03) 396 1053 or Kambrook Distributing, 44-60 Fenton Street, Huntingdale, Victoria 3166, ph: (03) 543 2200, fax: (03) 543 5308



Solar Power Modules

Solarex have released two new solar power modules: the 50Watt MSX50 and the 64Watt MSX64. Each module is individually tested and carries a 10-year, 90% output warranty.

The MSX50 produces 3 Amps at 14 Volts DC, and is designed for medium size applications such as instrumentation systems, security sensors and navigation aids. The MSX64 produces 4Amps 14Volts DC and is better suited for such things as remote home power, telecommunications, pumping and cathodic protection. These *Solarex* products conform to the AS3901 (IS0 9001) standard.

Soft Technology Christmas Gift Ideas

A subscription to *Soft Technology* at only $15.00 makes a fabulous year-long gift, and we include a greeting card with your message and some information about the Association and the magazine.

Membership of the ATA is another option, and includes subscription to the magazine, access to our library and keeps you up to date about all the good things we get up to each month.

A donation in somebody's name might be an "Investment in the Future" for a young child.

You could even give the gift of enrolment in one of our courses.

Finally, we sell copies of our book, *Build your own Green Technology*, which has all sorts of practical projects for the home handyperson and retails at $19.95 plus $5.00p&p

For more information, contact Solarex, 78 Biloela Street, Villawood, NSW 2163, ph: (02) 727 4455 fax: (02) 727 7447

The Regulator

BP Solar Australia have begun selling their own battery voltage regulator. The BPCR12-100 (12Volt, 10Amp) features low voltage disconnect and an LED display to indicate a load disconnection due to excessive battery discharge. Reconnection is automatic when batteries reach a "reasonable" state of charge.

The regulator may be mounted on horizontal or vertical surfaces. The retail price is $60 + 20% sales tax.

For further information, contact Kerrie King, BPSA Pty Ltd, PO Box 519, Brookvale, NSW 2100 or ph: (02) 938 5111

Quantum Leap

The *Quantum* solar boosted heat pump hot water system uses air-conditioner technology combined with solar panels to heat hot water between 15 and 75% cheaper than by conventional means.

The heat pump's evaporator panels enable a refrigerant vapour to gather heat from its surrounds. A pump compresses the vapour, causing it to become hotter, and the vapour then passes through a condenser coil wrapped around the water tank, cooling the refrigerant while producing hot water. No electric or gas heating is needed.

There are two units available: the *Compact*, which has the evaporator panels around the outside of the tank; and the *Split unit*, in which the panels can be placed elsewhere.

For more information, contact Tess Belbin, Quantum Link Energy Systems, 55 Derby Street, Silverwater, NSW 2141, ph: (02) 748 3488 fax: (02) 748 3201

New Inverters

Statpower Australia has released a new line of inverters in 125W, 200W, 800W, and 1500W continuous output ratings.

The switching efficiency from DC to AC power is reported to be over 90%. The 800W and 1500W units are designed to run 0.5 and 0.75 horsepower electric motors, while the smaller models feature optional remote control. Features include: rugged construction; self-protection against overload, overheating and short circuit; reverse polarity protection; and audible and visual alarms.

Prices range from $226 to $1695, depending on the capacity of the unit.

For further information contact Trevor Bird 3/16 Veronica Street, Capalaba, Queensland 4157, ph: (07) 245 2033 fax: (07) 245 2539

More Fun Gift Ideas

Compact fluoros - Save your friends money while they find out that these things really do work. Available from most hardware and lighting shops.

Photo Eye Switch light dimmer - a dimmer that detects daylight and shuts off incandescent light during the day - $14.95 from Dick Smith Electronics shops.

Solar battery rechargers - range from $9.95 to $16.95 - can take AAA, AA or C batteries and take 2-3hrs per battery. Available from Going Solar, (03) 328 4123.

3-6-9Volt photovoltaic panel - small lightweight panel that can either recharge batteries or use an adaptor to power a walkman or transistor radio. Priced at $23.95 from Going Solar, (03) 328 4123.

Personal Solar warning light - charge during the day, and use this flashing LED display for walking or bike riding at night. $15.95 from Going Solar, (03) 328 4123.

Australian Batteries

The *Suncycle* range of batteries are made by *Battery Energy* (the only wholly Australian-owned battery company), and designed specifically for solar/RAPS applications. Based on the Telecom style of unit, the batteries are optically clear to assist monitoring. Low self-discharge rate grids, and large electrolyte reservoirs, minimise maintenance and topping-up of the cells. The batteries have alloy grids for added strength which improve deep cycle capacity. The plates are 20% thicker, for longer life, and higher capacity at low discharge rates. Explosion proof vents with ceramic filters are standard, and transparent shrouds for lead surfaces and dust caps. All cells carry a 3 year replacement and a further 2 year *pro-rata* warranty. The batteries are RAPAS (NSW) approved.

For further information, contact Battery Energy, 2nd Floor, 541 Blackburn Road, Mt Waverly Victoria 3149, ph: (03) 550 0811 fax: (03) 562 9839

Australian-made Battery Conditioner

Batrolyte, made by *Candan Enterprises*, is a conditioner for all lead acid batteries. It works by dissolving existing and new sulphation on the plates, separators and electrolyte, back into solution. Batrolyte acts like a catalyst, regenerating acid and plates, allowing the battery to operate at full capacity. Benefits include: 18% increase in efficiency; 25% brighter lights; better and faster starts in climactic extremes; charge held longer between use; reduced chance of damaged plates; faster recovery rate.

For the kids

Solar Educational kit - learn about the application of solar power - make a solar-powered fan - $9.95 from Dick Smith.

Powertech Solar Power - a kit with 150 solar experiments for kids to learn all about solar power. Priced at $58.95

Minilabs Tech Series - smaller kits of experiments about solar, magnetic, mechanical principals. $18.95 each.

Solar Wooden Model - build a working model of a helicopter, gramophone or aeroplane which use solar power - $26.95.

For 5 years and up - a **plastic Meccano Solar Construction kit** - instructions to make 4 models including windmills and waterwheels which use solar power - $23.95

All of these kits are available from Going Solar, (03) 328 4123

Provided the conditioner is used on batteries less than eighteen months old, battery life can be increased by 2 or 3 times.

For further information, contact Robert Knox, MAK Agencies Pty Ltd, PO Box 578, Heathmont, Victoria 3135 ph: (03) 879 7598 fax: (03) 879 7608

Natural Wonder: Gas and Solar Savings

Australia's abundance of natural gas and sunshine has lead to the development by *Solahart* of a gas hot water system to which solar panels can be added. The result is reduced water heating costs and less dependence on gas heating. It's called the *Natural Wonder*. The unit has a five star efficiency rating. If two collector panels are added, a family of four can save up to 80% on their gas bill. The unit uses a unique forced draft concept and electric ignition, instead of a pilot light. According to the company this is a good way to begin using solar power because the cost is not much more than a conventional storage gas heater. Solar panels can also be added as the family or household expands. *Solahart* offer an extended warranty option for up to 15 years.

For further information, call Solahart Australia, 112 Pilbara St., Welshpool WA 6106, ph: (09) 458 6211, fax (09) 458 7640

Beginner's Solar Kit

NAPS have released a *Solar Lighting MiniKit*, for people who want to try out solar power for lighting. Add a battery and you have everything you need to install two 8W fluorescent lights, which can be operated for up to three hours a day. It is suitable for a shed or workshop and is easy to install. It sells at about $390.

For more information, contact Going Solar, 320 Victoria Street, North Melbourne, Victoria. ph: (03) 328 4123

Kambrook goodies

24 hour timer - with an override switch to manually control the appliances. $20.00

Automatic night light - photoelectric cell - as the room gets darker the light gets brighter, with a low wattage bulb. $20.00

Tier Garden Lights - According to Kambrook, these are energy savers - 6 lights use as much energy as a 60W globe, and a transformer brings the voltage from 240V to 12V which makes it much safer. 1 light is $19.00; pack of 4, plus wire and transformer is $66.00

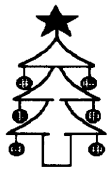
Available from the factory outlet, 176 Barkley St, Footscray, Victoria 3011, ph: (03) 396 1053

What a Gas

People who need an internal combustion engine to run their generator, waterpump, welder or lawn mower, but want to switch to an environmentally sounder machine need look no further! Gas Environmental Systems had a phone call one day asking for an LPG-run generator. After some searching, they eventually found an LPG unit that could be adapted to suit any air-cooled petrol engine.

The advantages of getting your petrol generator converted to LP gas are that the carbon monoxide pollution level is 90% less than for petrol generators, and the fuel cost is 50% less, leading to a lower running cost. Solar electricity users find that converted units make an excellent "back-up" power supply. An LP gas conversion for a 5.5kVA generator costs less than $1800. Gas Environmental Systems also sell pre-converted generators, waterpumps and replacement engines.

For more information contact Peter Duncan or John Nicholas at Gas Environmental Systems, PO Box 884, Bega, NSW 2550, ph: (064) 923 525 fax: (064) 923 626



Motor-Head Gifts

Solar battery charger - solar panel charges the battery through your cigarette lighter. Costs $29.95

Rechargeable tools:

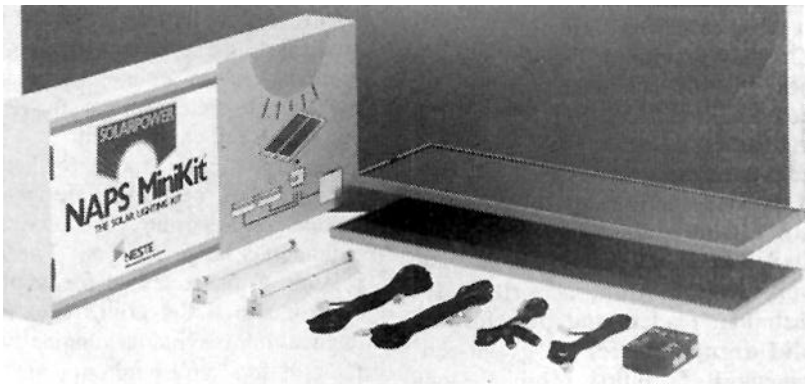
Large torch - $27.95

Power screwdriver - $55.95

Hand held vacuum cleaner - $60.

All can be recharged from completely flat in 15 hours plugged into your cigarette lighter.

Available from Going Solar (03) 328 4123



Reviews

The Greening of the Red

Graham Dunkley
Pluto Press, 1992.

Review by Alexandra Oke

Graham Dunkley's 126-page "pamphlet" is part of a series called "Strategies for Renewal" and reads rather like a policy document.

The first part examines "machine-chemical" industrialism and its accompanying political-economic systems, and judges them unsustainable, linking them directly to the present environmental crisis world-wide.

The second part defines and colour-codes various possible solutions to this crisis; "blue" stands for an orthodox, market-oriented approach; "green" for ecological sustainability, and "red" for social sustainability. The third section of the book draws upon both "green" and "red" (and several shades thereof) models to present the author's idea of the Ecologically and Socially Sustainable Organisation of Systems (EcSSOS) framework.

The book is well-resourced and provides as detailed and concise information as the GAIA atlas of Green Economics I reviewed for *Soft Technology 41*. However, in contrast, this is densely written in a heavy, academic style.

Unless the reader is prepared to take it slowly, or has a background in economics or politics, he or she will be overwhelmed. The paragraphs are long and detailed and acronyms are scattered cavalierly throughout.

Dunkley provides a glossary, but this does little to alleviate the problem - the book is still difficult to read and flipping back and forth to the glossary impedes progress.

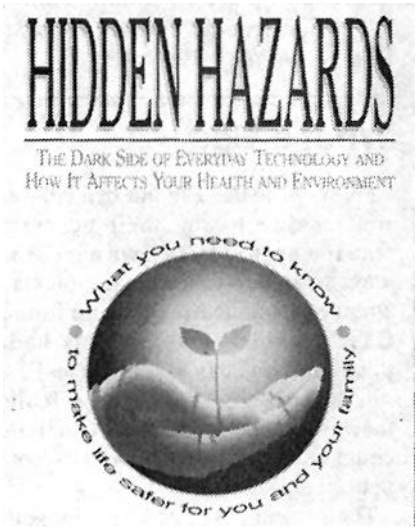
This book would be useful as a reference - it provides wide-ranging and detailed political, environmental and social information, is written for Australian readers and puts forward solid arguments for a "green-red" framework of solutions in both the long and short-term.

But sentences such as: "The main purpose of NEG is to cut RETP but because growth occurs at the margin, a long period of ZEG or NEG would be required to significantly reduce total RETP...." strike me as simply NBG in communicating interesting and potentially useful ideas to the masses.

Hidden Hazards

By
Dr Ronald S Laura
& John Ashton
Bantam Books, NY, 1991.

Review by James Hamlyn-Harris



The focus of this book is the "dark side of modern technology". The authors reveal a host of "toxic time-bombs" - cumulative poisons which result from food and water treatment, medical drug use, and other aspects of modern western technology, and discuss what to do to minimise the risks to our health and environment.

The introduction is a somewhat sensational start, seemingly designed to induce paranoia about the secrets the technocrats keep from us. The book sets out to be a manual for would-be environmental detectives seeking to expose and/or avoid the cumulative effects of food and environmental pollutants.

The first chapter briefly summarises the progress of science and technology over the last 250 years in fields ranging from energy production and agriculture to medical science. The gist of it is that by using science to solve the problems created by science, we have compounded the problems and made them even harder to solve.

What follows are sixteen chapters of specific hazards caused by modem technology. There is a chapter on microwave radiation and five chapters address the effects of food additives and impurities. A further four chapters deal with the community-wide measures used to improve public health, such as vaccination, chlorination, fluoridation, and dental fillings. The authors explore the effects of common household appliances such as air-conditioners, fluorescent lights, TV sets, personal appliances and other devices. (See the table in the EMR article in *Soft Technology 41* for the electrical fields generated by these appliances).

Each chapter finishes with a section on what you can do to protect yourself. A chapter on the physiological effects of noise pollution and a forward-looking conclusions chapter complete the book.

The book is well researched and contains a lot of relevant and interesting information on the numerous subtle cumulative toxins to which we're exposed.

It is unfortunate that the information is presented in a sensational and inflammatory way which will alienate some readers. But have a look at it: the authors may approach the subject with the enthusiasm of religious converts, but the information is still valid and important. Just take it with a grain of salt (or MSG if you dare!).

Letters

Dear sir

Having recently become a subscriber to *Soft Technology* and catching up with past issues, I note with interest your article "The Great Insulation Debate", in the December 1991 issue (No. 38).

I feel that there is one further consideration that must be taken into account in choosing insulation, and that is the recommended minimum R-value required, set out in Australian Standard AS2627 Part 1 - "Thermal Insulation of Roof/Ceiling in Dwellings which Require Heating", and the resultant thickness of material used.

For the safety of anyone working (for whatever reason) in a roof space, any insulation fitted should not cover the ceiling joists, since, if these are hidden, there is a likelihood of the worker falling through the ceiling. Since the usual ceiling joist thickness is in the region of 90mm, loose-fill insulation of any kind should be avoided where R-values of greater than about 2.4 are required.

Where thicker ceiling joists are used this limited R-value can, of course, be revised.

I would welcome any comments that you have to make on these insulation issues.

Yours sincerely,
Graham I. Sharley, Manager
Energy Information Centre
Adelaide

Dear Graham

Thank you for your letter and your comments. We are planning another, more comprehensive article on the subject of insulation for sometime next year; and will be looking at safety issues (as well as efficacy) then. Ed.

Hello,

I am keen to track down technical information and a potential builder/supplier of a windmill propulsion system for a 50 foot sailing boat and was wondering whether your organisation can assist.

I have been interested in such a project for some years after reading an article in Cruising World, August 1981, which I enclose for your information. My efforts to contact Jim Bates mentioned in this article have come to nothing. There probably have been major developments in wind power technology since that article was written and I know that much of the research is happening here in Australia.

My idea is to use an hydraulic, or possibly electric drive as the final transmission and I have been in touch with a manufacturer of hydraulic equipment on the Gold Coast to that end. What I now need is someone to help me resolve the engineering problems of installing an appropriate mast and housing for a boat and to buy/build an appropriately rated windmill. The sort of power output required is of the order of 80HP or 60kW in 15-20 knots of wind based on the current engine size of 110HP.

Any information and/or suggestions of who I could get in touch with about this would be most appreciated.

Best regards,
Stuart L Amyes, N.D. (Herbal),
G.M., A.T.M.S.

Dear Stuart.

We are working on it Stuart! In the meantime, if anyone else has any suggestions that may be of help to Stuart, please let us know, and we'llpass them on. Ed.

Dear Editor

Thank you for the prompt delivery of the *Soft Technology* issues. I have recently joined the Cairns Energy Action Group, promoting a Powering the Future Campaign here in far north Queensland. We hope to educate the public here in appropriate technology use and have just received a grant to build a mobile energy display. Our first major target is the region north of the Daintree River in the Wet Tropics.

My primary interests include current technology development and application, with special regard to the Cape Tribulation region and areas of freehold land south to the Daintree River. So as you can imagine, I thoroughly enjoy the magazine.

I am very interested in what you are doing and hope our campaign can help to further educate the locals in appropriate technology and thereby create a sustainable future.

Yours Sincerely,
Jeremy Cullen
Queensland

Dear Jeremy

Thank you for your interest - and good luck with your project. You might be able to get some ideas from our mobile display, the Energymobile, which is featured in the article on pages 15 - 19 in this issue. Ed.

Dear Editor,

I read with interest, the article by Alexandra Oke called "The Good Life: City and Country Alternatives". I am interested in knowing more about the hydronic heating problem. Could you tell me whether

(a) you can buy a system,
(b) can you make one,
(c) provide me with some reading material on the system.

Yours, Trish McGuane

Dear Trish

Glad you enjoyed the article! We have made some enquiries and have discovered that yes, you can buy systems and you can make them - the catch being that both options can be expensive. With regard to reading matter as there is apparently quite a variety of designs and styles of hydronic heating systems, all with their own properties, we have decided to do an article on the subject for a forthcoming issue of Soft Technology. Ed

The continuing saga of Compact Fluorescent lamps and Power Factors just won't go away. Overleaf, Kali McLachlan, of the Rainbow Power Company in Nimbin has (we hope?) the last word.

Kali McLachlan

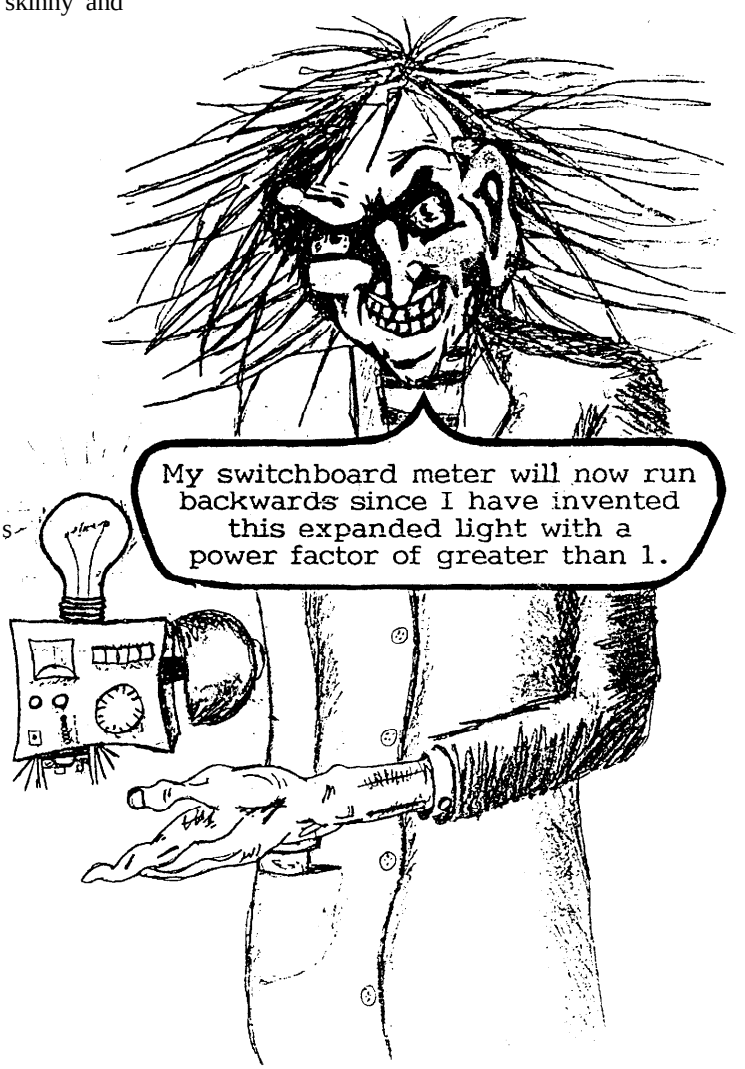
I'd like to talk to you this issue about Compact Fluorescent lights. You've heard a lot about them of late with the different brands and *Soft Technology* going quite *CHOICE* about value for money, colour efficiency and Power Factor. This magic virtue is a real seller because no-one seems to know what it means! I've had salesman giving me all sorts of lights that are meant to be better than the rest and now I have a carton box full.

Perhaps a few definitions are in order. Compact fluoro means that a fluorescent lamp has been made skinny and folded up a bit so it can be stuck in place of a light globe. "Performer" lamps can be pulled in half. Phillips lamps have more smoke inside and Wotan lamps are meant to have the best Power Factor. That term again.

Power Factor is the ratio of the power used by something over the apparent consumption based on the current drawn, and this is larger because appliances often consume wattless current.

Before electronics was invented the current used by things was the same shape as the voltage wave, but just before or after it by varying amounts. Engineers accounted for this by claiming that things used an imaginary current as well as the real current and that this imaginary current could be either a quarter wave ahead or behind the voltage cycles. Power Factor became a real over actual current.

Now things have gotten really out of control because electronically controlled appliances can take a gulp out of the voltage wave anywhere they like, and they do. Phillips lights take a great gulp as the voltage is on the front edge of its wave. Performers take a gulp at the beginning and a bit more off the top. The result is *Bent Voltage Waves.* The bent waves cause computer screens to jiggle a bit and some sensitive gear to run a bit rough, but they don't upset kWh meters. You only pay for the energy consumed in your house. The electricity authority however is not set up to supply bent waves.



Lots of energy is wasted on the other side of the meter (ie before you pay for it) thanks to these bent waves, so the energy savings to the planet are not nearly as good as they may at first appear.

Electrical engineers don't like the concept of bent waves, so instead they say that what is happening is that waves of wrong rate are being generated by the lamp - in particular, waves of 150, 250 and 350 cycles instead of the orthodox 50. This is a really clever concept.

It makes it all look like the consumer's fault. These harmonic waves are no more silly than the "imaginary" ones that the customer has been traditionally accused of consuming. Harmonic waves also can have imaginary auxilliaries, and they can flow from one customer to another and cause crosstalk between different appliances.

This anarchistic situation of consumers feeding harmonics to each other is deeply disturbing to our centralist power authority who are mooting regulations to control harmonic generation.

We find some lamps claiming a Power Factor of 1. I have measured some at greater than 1. The old iron ballasted buzzy fluorescent lights had Power Factor of only .37, but this could be fixed with a $3 capacitor consuming one third of an ampere of imaginary current.

The term Power Factor has become an imaginary virtue.

What's On?

A look at happenings around the country

The CONFEST is back!

December 30th - January 4th 1992/3

The Down to Earth Conference Festival will be held this year near Shepparton in Victoria. BY0 camping gear!

Demonstrations, discussions and workshops are held by many diverse groups and individuals, and topics include alternative technology and building, permaculture, natural healing, massage, personal growth, self management and community politics. There will also be music, dancing and theatre, a Children's Village, and of course, wonderful opportunities to make friends and contacts. Ticket prices range from free(!) to $40 depending on your situation.

For details and tickets, phone: (03) 416 2803 or (018) 569 671, or post a SSAE to Down to Earth, 222 Brunswick St Fitzroy 3065.

Permaculture Course Victoria

13th - 27th February 1993
20th March - 2nd April 1993

If you are planning to live, or are already living, in inland or upland Victoria, these 72-hour live in courses are an excellent chance to learn about permaculture design for these areas (or a similar climate).

They are to be held at Hepburn Springs and Seymour, and both courses have an emphasis on learning through local site visits and case studies of appropriate design. Tutors include David Holmgren (co-author of Permaculture One) and Ian Lillington. There are only 20 places on each course, so get in early.

If you are interested, send a SAE to: 16 Fourteenth St, Hepburn, Vic 3461, or ring (053) 48 3636. Concessions are available.

Permaculture Design Course NSW

Far South Coast.
9th-23rd January
6th & 7th February

A great way to learn about permaculture design, specific to cool temperate systems and species. This is a 2 week, full-time, residential course. The tutors are Hugh Gravestein and Andrew Sheridan. There is a limit of 20 per course. **Register A.S.A.P.** There is also a special weekend introductory course on February 6th & 7th.

Enquiries to: H Gravestein c/o Wyndham Post Office, 2550. Ph: (064) 942 014.

We are trying to make *Soft Technology* a truly national magazine. If you have any information about **What's On,** wherever you are, please send it in to us - it will be most welcome. New ventures, projects, businesses, conferences, festivals, events....send it all to What's On, c/- ***Soft Technology.***
Looking forward to hearing from you!!

Greenhouse Conference

10th - 12th February, 1993

This conference has been convened by the Centres for Environmental Science and, Health, Education and Social Sciences at Monash University College, Gippsland, Victoria, and co-sponsored by the Australian Institute of Energy. It is planned as a discussion of the social, economic and environmental issues raised by impacts of the Greenhouse Effect and associated policies on regions dependant on the energy industry.

The conference will feature workshops with opportunity for all participants to discuss issues. Speakers will include leaders from science, industry, government and academia.

Anyone interested in further information should write to:
Dr Sharon Pfueller
Centre for Environmental Science
Monash University College Gippsland
Churchill, 3842, Victoria, Australia
Phone: (051) 22 6453

Green Desires

Adelaide, February 1993

REDESIGN is a group of environmentally-conscious designers -Architects, graphic designers, engineers and others

They have put together Green Desires, an Exhibition of Objects and Issues, demonstrating that the design, manufacture, purchase and use of products can all be made to contribute to ecological well-being. Products manufactured in both Australia and Overseas will be featured, and the exhibition will deal with the themes of energy, transport, the home, the garden, the office, clothing, sun protection, waste and water. A catalogue will be available with the exhibition.

For further information, contact: Von Affleck, Green Desires Project Assistant and REDESIGN Public Officer on (03) 808 4795.

For more info on 'What's On', turn to page 66.

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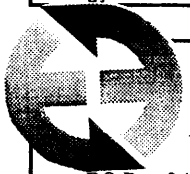

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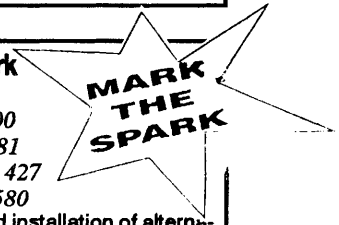

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Organised by: Moora Moora Co-operative Community, Commonground Co-operative, Vesper Community, Mulkirri Mob Community

No increase in entry price: $20/Family, $8/Adult, $5/Child or Concession. One payment covers all activities
Come to Healesville via Maroondah Hwy, then follow the signs. No drugs, alcohol, no dogs or cats please.

A PARTING SHOT

Confessions of an ATA Groupie

Last friday I climbed up onto the third storey of a tower that I couldn't help noticing was swaying ever so gently in the strengthening wind. I was told it's all a matter of design: a good tower will give a bit before the wind so it won't crash over in a gale.

Oh. Okay.

I admit, two months ago I would have asked to get off. Now.

Preferably without any mucking about on the three ladders we used to get up there, thank you very much.

But this afternoon, I nodded and got on with enjoying the view across a green swathe of Gippsland to Phillip Island from the top of Bruce Mackenzie's windgenerator tower. Two eagles were circling, riding updrafts in the distance, and I felt much the same. Since being hurled into work at the ATA in August, I've been through so much culture shock that windgenerator towers are quite honestly the least of it.

I had always thought that Appropriate Technology was A Good Thing, but admittedly had really never looked at it that closely. It was good to know somebody was working on that kind of stuff. Then, on my first day in at the ATA I answered the phone and somebody asked me seriously about composting toilets. Now, while no doubt composting toilets are A Good Thing, this was entirely too much of A Good Thing. I rose to the challenge magnificently: I ran away and got someone else to talk to them.

Sadly, that only worked a few times. In the next few weeks I took crash courses in passive solar design, mudbricks, savonius rotors and permaculture, and was introduced to the realities of self-funding community groups. I got so used to there being no money that when we were invited to a rather lavish media launch I was most impressed with (a) getting a printed name tag (I could use it again); and (b) the food (I wouldn't have to buy lunch). My brush with corporatism jolted me: it was boring, it was expensive and supposedly perfectly normal.

It can't compare with meeting people who base their lifestyles on the sun and the wind, and have houses full of light that work magically well. Or seeing pictures of the latest recumbent bike with fairing and seriously having covetous thoughts. Or delving into the mysteries of EMR, or permaculture, and plotting for hours at a time to convert the world with the Energymobile. Or trying to shake the nagging feeling, as I gather material for the columns, that we aren't so much discovering technology that works with the earth as relearning it.

Composting toilets seem perfectly normal now, but occasionally I get a dose of perspective from the other direction. Imelda (the editor) came into the office a while back shaking her head after a telephone call. "If anyone had said to me eighteen months ago I would tell someone I would *love* to read their book on Sensible Sludge, and *mean* it..." she muttered, ruffling through piles of paper to do with model solar cars and organic paints and earth-sheltered houses.

Sensible Sludge. Composting Toilets. Waltzing windgenerator towers. It's too late for me. As far as I'm concerned now, you can never have too much of A Good Thing.

Alexandra Oke

Alexandra has recently joined the happy band at Soft Technology as a writer and sometime composting toilet expert.

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SOLAREX

78 Biloela Street, Villawood 2163.
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