

# HUFF



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## Letter from the Editor

A new \$25,000 cash prize will be awarded to the first single-rider HPV to equal or surpass 90 kilometres in an hour sponsored by the Dempsey World Record Associates. Supplemental awards of \$2000 will be offered to any competitor who breaks an official hour record by 3% during the period of the prize. In addition \$500 will be awarded to the winner of the yearly hour race at the annual human powered speed championships. HPV members from any country may compete for the prize and the challenge may take place in any country. The current unlimited world hour record is held by the Canadian amateur Sam Whittingham at 79.136 km set in 1998 at Blainville which is more than 20kp/h faster than the standing traditional cycling record set by Chris Boardman in 1996 at 56.137 km.

I haven't heard of any record attempts by Australians with HPV's and wonder if there's any interest in getting something happening before the prizes closes in 5 years time.

**Timothy Smith**

## 1999 6 Hour Challenge

This HPV race was held on June 6 at the Sutton Rd. Driver Training Course near Canberra. The rules for the event were very laissez faire with just about any combination of riders and machines allowed. This is vastly different to other Australian HPV races (ie Wonthaggi, Maryborough, Murray Bridge) which require that vehicles have 3 or 4 wheels, have footplates below the pedals and a minimum distance between wheels etc.

There were 15 entries up from 5 last year (The Wonthaggi event had a similar growth with 22 entries, up from 4) and I am sure that events of this type will continue to grow in popularity.

**Weather and track:** A challenging course, but lots of fun to ride, it included a lot of hills for a track course. Weather deteriorated through the day from mild and dry to mild and wet, this did not dampen enthusiasm though.

**Riders:** Here are some results and rider groups described. (Thanks to Wayne Kotzur, Drew Carnell, Damien Clarke and Moz who provided the information I did not gather on the day.)

*Continued on Page 3*



Team No.	Category	Riders / Vehicles	Laps Covered	Place	Av Speed	Fastest Lap
1	Open Team Male team entry	Peter McLennan-Sport Bicycle, John Dasousa-Sport Bicycle	73 laps 178.26 Km	<b>1</b>	28.8	0:04:13
2	Open Individual, individual entry	Ian Humphries-Greenspeed Touring Trike	70 Laps 171 km	<b>2</b>	27.9	0:04:14
3	Open Individual, individual entry	Mike Dennis-Greenspeed race trike	60	<b>4</b>	23.8	0:04:15
4	Junior, team entry	Ben Curtis-MTB, Alex Lorroway-MTB, Alexander Spencor-MTB, Patrick Elsley-MTB, Ben Wannier-MTB	46	8	18.2	0:07:05
5	Open Team Male, team entry	Stephen Nurse-Hammerhead Special, Clinton McDonald-Trisled Touring Trike	57	6	22.4	0:05:50
6	Open Team Male, team entry	Ben Goodall-Trisled Fastback, Will Kirkham-Trisled Fastback	63 Laps 153 km	<b>3</b>	24.9	0:05:04
7	Veteran 35-44, individual entry	John Armstrong-Swift Trike				
8	Open Individual, individual entry	Andrew Carnell-Sport Bicycle	42	9	16.7	0:05:07
9	Open Individual, individual entry	Kylie Carnell-Sport Bicycle	14	15	12.2	0:07:23
10	Open Individual, individual entry	Leonie Armstrong, Sport Bicycle	14	16	12.2	0:07:25
11	Open Individual, individual entry	Andrew Pratt-Sport Bicycle	15	14	6.0	0:05:09
12	Family Team, team entry	Colin Lee-sports, Ted Johnson-sports, Liam Curtis-rec/mountain, Sam Johnson, Nick Johnson	48	7	19.0	0:05:25
13	Family Team, team entry	Helen Gardner-swb rec, Liz Lynzaat-sports, Jenni Boon-mtb, Wayne Kotzur-swb faired rec, Jack Egan-sports	42	10	16.5	0:07:07
14	Veteran 55+, individual entry	Robin Whyte-Sport Bicycle	22	13	25.2	0:05:12
15	Open Team Male, team entry	Damien Clark-swb rec, Paul Segal-tandem rec, Duncan Cleland-tandem rec, Chris Curtis-elec assist trike	59	5	23.3	0:04:51
16			41	11	19.2	0:05:38
17			36	12	14.3	0:08:11

*Continued from Page 1*

Peter McLennan and John de Sousa (two diamond frame riders) formed a relay team which placed first overall by covering the most laps of any of the groups.

Ian Humphries rode a low Greenspeed trike to be 2nd overall and individual winner. Similar trikes were ridden by Mike Dennis (Greenspeed, 4th overall and individual runner up) and Ben Goodall / Will Kirkham (Trisled, placed 3rd overall and 2nd in the teams). The race lead swapped several times during the race due to punctures and only a few laps separated 1st and 2nd place



"The Officials Team" included usual suspects Damien Clark, Chris Curtis, Paul and Lindsay Segal and Duncan Cleland. They placed well in the event without seeming to make much effort. They had the right equipment: Chris Curtis' trike was electric assisted and there were a couple of fast Kotzur tandems in there as well.

1st place in the 35 - 45 age group was John Armstrong who rode a Swift recumbent trike, he pedalled consistently all day for a strong result.

Helen Curtis won the women's event on a Kotzur short wheel base recumbent, from the photo it looks like she even had fun doing it.

"My team" was myself and Clinton McDonald, we swapped



between a Trisled touring trike and my homebuilt recumbent bike, the bike getting the most use. The problems we had were: getting rained on, not fit

enough, chain coming off and brake adjustment, not too bad for a 6 hour ride.

Kids team - a group of 5 kids completed the ride: they had short ride stints and obvious enthusiasm.

Family teams - included the Kotzur family who brought along a caravan to hang out in for the day.

Wayne Kotzur had an old Gateway computer box tied to his bike as a tail cone, somehow it survived the rain.

Andrew Pratt won the merit award for a prodigious effort - after his bike broke down in the very early stages he ran and walked around the track for the rest of the race. The man is a legend.

Lap counting for the event was done on a PC using software written by Damien Clarke: a mouse click as a competitor passed added 1 to that person's lap count and timed the lap. This system worked well and provided accurate results.

Thanks to all the officials who organised and set up the event, it was a hoot, and I look forward to taking part in the next OzHpv 6 Hour.

Next years Six Hour Challenge will be held on Sat 25th March 2000 (day before daylight savings) will be 12 hours 7am-7pm with (9am-3pm) shorter challenge within it. Venue yet to be established - probably public road circuit.

**Steve Nurse**

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Ian Humphries, Ben Goodall and Mike Dennis

# Introduction to Carbon Fibre

Some of you may remember my carbon fibre trike at the HPV meet in Canberra several years back. At that stage I had never used carbon before and nearly 50% of the carbon used was not contributing to the strength of the machine! I had used too little carbon in some areas (notably the boom tube!) and too much in others. Having messed around with carbon for the last couple of years, I hope to share my learning experience.

Treat this as a "Beginner's Guide". It is not intended to be comprehensive.

Despite popular stories, carbon is not prohibitively expensive. Raw materials cost about the same as an equivalent steel frame. The time involved in composing your creation however is significant. My trike was called "Midnight Special" for a reason!

## What is Carbon Fibre??

CF comes as a very fine silk-like graphite fibre. A 5mm ribbon typically contains 12000 fibres!! The fibre is light, strong, does not burn or rust. However it requires some kind of agent to hold a matrix of fibres in place to take loads from a structure. This usually takes the form of an epoxy resin. Note that the resin is not as strong as the fibre and is there only to provide location and form to the fibre matrix. The use of carbon fibre is very similar to using fibreglass in technique.

## How do I buy Carbon Fibre??

Carbon cloth comes in a number of forms:

- \* Carbon Ribbon or Tow sold in 4kg spools. A spool of 5mm tow contains 5km of the stuff and costs 10c/m.
- \* Carbon Tape contains several ribbons side by side. I have not used tape.
- \* Uni-directional Matting is like wide tape with all fibres going the same way. The sheet typically comes in 300, 600 and 1200mm widths and various weights from 50g/m<sup>2</sup> to 500g/m<sup>2</sup>. I usually use 300g/m<sup>2</sup>. Costs in the order of \$50/m<sup>2</sup>
- \* Woven matting has fibres woven at 90 degrees like a flax basket. Comes in similar widths, weights and costs to unidirectional fibre. This cloth can be skewed to different fibre angles.

Now that you have fibre, you will need to buy epoxy resin to stop the bike falling apart. There are literally hundreds of resins available, purchased as a two pack of resin/hardener. It is best to buy many small packs as opposed to few large packs. Important things to consider are :

- \* Shelf life
- \* Working time (gel time)
- \* Post cure temperature (low temperature post cure is best for home constructors)

I have used a variety of epoxies and suggest West System 105 as a good all round laminating epoxy.

It is possible to purchase "Prepreg" matting which already has the epoxy mixed and impregnated into the matting. This must be kept in a freezer to prevent it from curing and has a limited shelf life. Prepreg cloths need to be transported in a freezer, are very expensive and usually require a higher cook temperature requiring access to an autoclave oven. Chances are you will not be popular putting your carbon masterpiece alongside the family roast.

Most fibreglassing shops or boat builders can advise you of suppliers for these materials.

## Molds and Design

Fibre alignment is the most critical factor in carbon structure design. Carbon fibre is only strong in one direction! This will dictate whether you use uni-directional fibre or woven matting. As a rule of thumb, use uni-directional fibre wherever possible, woven matting for tight corners and reinforcing, and use ribbon winding for tubes. (see later note)

The number of layers to add at various parts of the structure depends upon the weight of cloth. This is something you will learn from experience. I generally use from 4 to 12 layers of 300 g/m<sup>2</sup> for most things.

You should budget for around 40-50% epoxy resin by weight in any given CF structure.

For a given circular Cro-Moly steel tube, double the wall thickness to gain equivalent strength using carbon and the tube will end up about half the weight. Remember you no longer have to design with tubes and joints!

Designing molds for carbon is difficult. A mold is the best way to get a nice finish on the product. You can design a male or female mold but remember that you should be able to separate the mold from your product! Bearing in mind that you must have continuity of fibre to get strength, and shapes are seldom simple enough to allow mechanical release you can see limitations to this method. Ways around this:

- \* Construct a mold in two mating halves and bond together the two halves later. You lose continuity of fibre doing this!
- \* Add one layer to a mold and cure. Then separate using any barbaric means available to you, rejoin and use this as you new lightweight mold for subsequent layers.

\* Use a lightweight foam mold which remains part of the finished structure.

I use 3mm MDF to make molds. Glue many layers together then shave to the right shape. The layers then look like a contour map so it's easy to get everything symmetrical.

There are special epoxy mold releases available. Use lots of layers and remove work from the mold as soon as it is strong enough to do so. For shapes where finish is not important, plastic shopping bags make a perfect mold release! (use two layers)

Compressing your work on a male mold is a "simple" process of winding around peel ply tape. It is possible to use a technique called vacuum bagging to compress outwards into a female mold although this requires expensive equipment. I have used mountain bike inner tubes under positive pressure to achieve a similar goal although this is not a perfect technique.

## How to Make Something (Laying Up)

1. Cut your carbon cloth to suit the shape. Ordinary scissors are OK for carbon but Kevlar requires special scissors.
2. Pull on some latex gloves. (available in supermarket)
3. Mix up a small amount of resin in a metal tin - just enough to cover the surface area of cloth. Measure epoxy resin and hardener with 60ml and 25ml syringes respectively. Make sure the mix ratio is measured accurately! You now have about 40 minutes before the epoxy gels and becomes unworkable. As a guide I mix no more than 50 ml resin at a time. Oh, and you need a spreading spatula - I use a plastic knife. (file off the teeth!)
4. Spread the epoxy sparingly across the fibre and apply wet cloth to the mold in successive layers.
5. Once complete, compress the carbon onto the mold using a peel ply tape which is full of little holes and lets excess epoxy out. Use any foul means to squeeze out excess epoxy.
6. Clean up now. Cured resin will remove concrete, floorboards, lino and carpet (oops!) as you scrape it off.
7. Leave in the sun to cure for a few hours. Once the structure is basically cured, it is best to "post cure" it to obtain best strength. This is like heat treating a metal structure. Post cure processes are different for each epoxy, but for low temperature epoxies, typical post cure cycles would be 50 degC for 14 hours, or 60 degC for 10 hours, or 70 degC for 8 hours. You will need to use some imagination as to how best carry this out. I have used a Melamine box lined with black high density foam

(sleeping mat) and having a perspex window on top to let the sun in. It gets to about 50 deg in there. On cold days, put a 100W light bulb in the bottom of the box and have a thermometer in the window.

8. Once post cured, remove the peel ply and attempt to remove the CF from the mold. Note that full strength will not be obtained for a week or so.

## Toxicity

All the doctors say we need a bit of fibre in the diet. The graphite fibre is not in itself toxic, but it is hard to swallow. The resins themselves are not particularly volatile (smelly), however it is good practice to work in a well ventilated area. Once cured, you will often need to file or sand the product. Here you will need skin coverage and a face mask - don't skimp here!! After filing, this dust is warm and lighter than air, so floats around a long time. The ketone thinners for epoxy resins is particularly (good smelling) nasty and you should keep this away from your nose, skin, small animals etc. It is quite effective on cockroaches!

## Bonding

Bonding refers to the joining together of several cured CF structures. You can use the same epoxy as used in laminating (needs thickening to lower viscosity - add microspheres) or you can use specialist bonding epoxies which are extremely strong. I have never experienced failure of a properly implemented bonded joint. This stuff has characteristics remarkably similar to Araldite. As a rule, the longer the cure time, the better the bond. Leave all epoxies at least a week before applying any stress.

## Tube making

A special technique can be used to lay up carbon fibre tubing. It consists of winding a ribbon of carbon fibre around a former. Using this technique, round, oval, tapered tubes and tubes of varying cross sections can be constructed.

The ribbon (called Carbon Tow) is wound at various angles (say 30, 45 degrees) in successive layers in an interleaved herring bone pattern. It looks impossible until you try it! I have developed programs to predict strength of such tubing for given winding patterns and layering. It also estimates material consumption and weight.

Commercial machine wound tubing is available at typically \$100 per linear metre for frame sized tubing.

So there you go... I recommend you go buy some and try it out. You will be surprised how good this stuff is!

**Mike Dennis**

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Sydney Recumbent Riders

# West Australian Recumbent Riders "ride" report.

Every two weeks a small group of dedicated cyclists pull on their anti-lycra, climb aboard their conveyances and inventions and head for Ginos on the cappuccino strip in Fremantle, West Australia for brekky and a chat.

Today there were six of us, Dave Doust and Mike King with their Greenspeed trikes, Paula Tscholakoff with Logo trike, Gary King on his laid back "Slumbaroo", and myself on my bikeE. Also present was Des Hannah, gleanng some ideas from the machines for a homebuilt trike.

Our Sunday get-togethers are more of a social event than a ride as such, just a chance to get together and exchange views, check out each other's bikes and trikes, and perhaps take them out for a spin.

Today at 10am it started raining (did I say raining? I mean pelting!) and just didn't let up the rest of the day. So three of us went off to "surf" through the puddles to North Cottesloe, where I had my car parked.

Mike and Paula (Greenspeed and Logo trikes, no mudguards) went home to surf the net instead.

Riding in the rain has some advantages, not too many walkers and dogs out on the dual-use paths, which were behaving more like rivers than paths.

Gary King's homebuilt complete with his new white Tioga comp pool slick seemed to handle well in the wet, setting up a pretty good bow-wave.

Despite the longer waterline length of my bikeE, I wasn't any faster. I think being more upright, I have a greater water resistance. Dave Doust on his Greenspeed seemed to enjoy zooming in and out of puddles, leaving triple roostertails.

Somehow we lost Gary along the way, only to find him about an hour later at my place. He had decided to brush up on his skill at fixing punctures in heavy rain.

Yes, the white Tioga had gone down on its maiden voyage. Despite that, Gary still got to my place before I did! That's what



I call puncture repair expertise. I suppose that comes from commuting on a Moulton every day to work through Perth's "prickle belt".

As I mentioned, we meet every two weeks. If you're tired of numb hands, sore bum and flying over the handlebars under braking, come for a chat and a ride.

**Geoff Law** - Perth, Australia  
geofflaw@bigpond.com



# Bits and Pieces

\* Queensland Recumbent Enthusiast Group has a new web site at <http://sunsite.anu.edu.au/community/ozhpv/qldhpv/index.htm>

\* More effort needs to be made in assembling a resource list available to members, so far responses have been very very few, though of excellent quality.

\* A new Secretary is required. Peter Heal is now very heavily occupied by work commitments and will be sorely missed by both Oz HPV and Pedal Power.

\* Some of the organisers of the Adelaide Pedal Prix read Steve Nurse's article about the Wonthaggi event in the June / July edition of cyclist and they've invited him to cover that event for "cyclist", It sounds too good to miss so he's just starting to plan the trip to Murray Bridge now.

\* Ben Goodall from Tri-Sled HPV's is in the process of getting a web site going at the moment. <http://www.trisled.com.au>

\* For more information on the 6 hour race see the OzHPV web site as well as a report & pictures by Chris Moseley at <http://homepages.ihug.com.au/~moz1/19990606.html>  
<http://homepages.ihug.com.au/~moz1/index.html>

\* HPV CHALLENGE - Largely unchanged the hugely successful weekend of racing is planned for 6/7th November. There is talk of re-establishing the shopping circuit, and perhaps persuading some recumbent riders not to try the steep descent off the Mount in the enduro.

\* RECUMBENT TOUR - Touring members would like to see more touring rides, that involving camping or hostelling. OzHPV is tentatively involved in organising a spring tour over two-three days in the Highlands of NSW. Please contact Wayne Kotzur if you would like to contribute to the idea.

\* Membership - it was decided to raise membership to \$15 especially as we have now joined the IHPVA and considering BFA membership.



Helen Curtis at speed

\* World HPV championships in Interlaken, Switzerland - Ian Humphries will be riding his new Greenspeed RACE trike from Paris to Interlaken in the first two weeks of August and then to the PBP. An IHPVA meeting is to be held at the same time - anyone have anything they would like raised at that meeting? Keep thinking!

\* Ian is also writing an article promoting recumbents and OzHPV groups for the Audax newsletter "Checkpoint" - it will be circulated to 500 or so Audax riders Australia wide next month.

\* The recumbent trike review recently published in HUFF is also now in the June-July issue of Australian Cyclist.

\* Ian Humphries is ordering some of the IHPVA resource material, he will order the videos that the IHPVA have for sale in the next few weeks to see if anything could be useful for our video. Does anyone already have any??



\* I have recently received a copy of the video footage taken at our last ride and meeting on April 18th. About 15 minutes of footage was shot and edited down to about 10 minutes of lively footage by Nigel Coates of "Blue Jeans Media". Most footage was taken of people cycling while Nigel videoed as he roller bladed alongside,

in front or behind. The footage is excellent and riders perspective is shown well - it will be very useful stuff. Some good editing techniques were used. Music and titles were added. Cost is yet to be determined. I will talk more with him about this and future videoing.

**Ian H**

Head Up Feet First is the Newsletter of OzHPV Incorporated. The ever developing Web site can be found at <http://sunsite.anu.edu.au/community/ozhpv/index.htm>. If you want to contact OzHPV by mail the address is OzHPV Inc, Post Office Box 1662, WODEN ACT 2606.

# HPV Canterbury

OzHPV has begun an exchange of newsletters with HPV Canterbury based in Christchurch, New Zealand for the mutual interest and benefit of both our clubs.

Their intent is to produce the newsletters on a bimonthly basis. Larger, more in-depth items will be published separately, but be distributed with the newsletters.

Our HPV Canterbury committee met in mid-May and it was agreed that we contact OzHPV of matters that may be of mutual interest.

## The Fringe Games

These are mooted as being an off-the-wall Olympics. Subject

to sponsorship, they are to be staged in Christchurch in September 2000. You can find details of their plans at:

<http://www.fringegames.org/index.html>

with the cycle/HPV events being listed at:

[http://www.fringegames.org/events\\_cycling.html](http://www.fringegames.org/events_cycling.html)

a local paper wrote a recent feature on it at:

<http://www.press.co.nz/17/99042614.htm>

If the Fringe Games do go ahead, it will be a great opportunity for the Oz and Kiwi HPVers display their wares and show their abilities.

We would like to simply make ourselves better known to the Australian HPV community and, as a first step, this seems a good way of having this happen.

Paul Dunlop, Christchurch New Zealand  
[dunlopp@admin.chchp.ac.nz](mailto:dunlopp@admin.chchp.ac.nz)

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## Coming Events

**WA Recumbent Riders** : Meeting every second Sunday 9:00 AM at Gino's Cafe, (or across the street from it) on South Terrace, Fremantle (it's on the cafe strip). If you are in the Perth area and have a recumbent or are interested in recumbents, be there! We're there a couple of hours eating breakfast, drinking cappacino and talkin' 'bents. E-mail Geoff Law [geofflaw@bigpond.com](mailto:geofflaw@bigpond.com) or Gary King [gary@oceandigital.com.au](mailto:gary@oceandigital.com.au) Ph (08) 93411381 if you have queries.

**Sydney Recumbent Riders**: The Sydney Recumbent Rider's social gatherings, rides and demo days are usually held on the 3rd Saturday or Sunday of every EVEN month. Contact Ian Humphries. (02) 9550 2805 (home) (02) 9845 3988 (w)

**Queensland Recumbent Enthusiast Group**: Late August, Industrial Design & Technology Teachers Assn. (INTAD) Pedal Prix. Venue to be decided, likelihood of the Gold Coast. This event involves a 6 hour endurance race. More info to come regarding event. Contact Darryl Shelswell Ph 0732033025,

Ray Hembrow 20 Murchison St Carina 4152, Brisbane 07 3843 2729 after 6.00 pm or email David Johnston [davej@ecn.net.au](mailto:davej@ecn.net.au)

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**Melbourne Recumbent Riders**: 8th August, Approx 30km, Meet at Mordialloc Pier, Melway 92, E2, 10am. Ride from Mordialloc and finish in the city (ride along Beach Rd, Fitzroy St. & St. Kilda roads), stop for a snack at a cafe along the way, the start and finish are right near railway stations.

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### The Australian International Pedal Prix

1999- Scrutineering: Friday 17th September, 24 hour Endurance race: Saturday 18th, Sunday 19th September Held at Sturt Reserve, Murray Bridge, South Australia

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**The Biggie!! OzHPV Canberra Challenge** 6th & 7th November. Venue Sutton Rd Driver Training Centre. More Details soon!

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**Tasmania Recumbent Enthusiast Group**: Contact Timothy Smith Devonport Ph 0364234559 or Richard Hoad Ph 0362787247 in Hobart.

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