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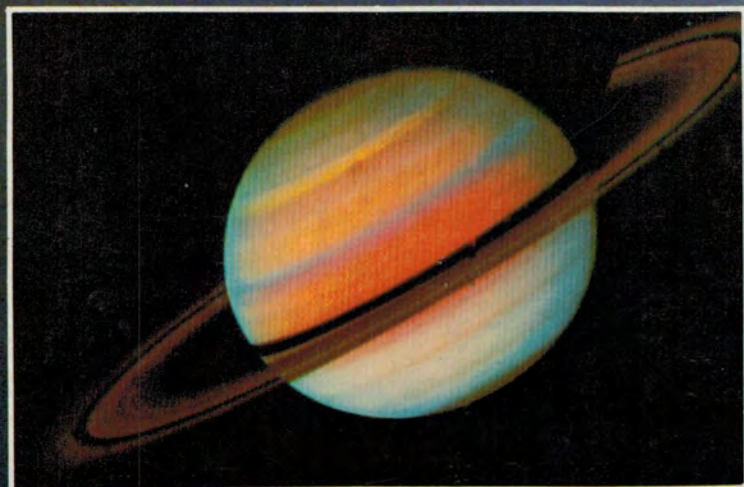
**ELECTRONICS
TODAY
INTERNATIONAL**

NEGATIVE ION GENERATORS -fact & fiction

**AIR IONISER
TO BUILD!**

Video war hots up!

Kenwood FM tuner reviewed



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- the strange planet**

**10th
BIRTHDAY
ISSUE**

**DICK SMITH
CATALOGUE
INSIDE**

The negative ion generator

— product of the future, or no future for the product ?

Apart from electrons, ions and ozone, a cloud of suspicion hangs around negative ion generators. And not without reason. 'Hard' evidence to support the myriad claims made for them is difficult to come by. We hope this article provides some background to readers wanting to investigate the subject for themselves.

Dee Warring

THE 'NEGATIVE ION INDUSTRY' is booming. In the last three years in the United States the number of companies manufacturing negative ion generators has jumped from three to fifty-seven.

In Australia, the two companies which have been importing generators for several years, Bionic Products and Wentworth Electronics, were joined last year by several other importers and the first Australian manufacturer.

Buyers and users of generators are said to come from all walks of life and from all parts of Australia — parliamentarians, surgeons and GPs, hospital staff and patients, office workers, shop workers, mothers and health nuts. They pay anywhere between \$85 and \$300 for a generator. Considering the simple construction of the devices this seems a high price, but the manufacturers argue that their prices are not high considering the benefits people can expect to gain. They claim that the generators will give you a feeling of relaxation and well-being, clean the air of tobacco smoke and bacteria, increase concentration and alertness, and give relief from asthma, allergies, bronchitis, sinusitis and migraines. Asked why the prices are so high, Joshua Shaw, manager of Bionic Products, said: "If you're an asthmatic and faced with paying out \$500 every year on drugs for the rest of your life, to spend \$300 on a machine which can cure you for life seems a small price to pay."

The manufacturers also claim that the high cost of research has forced the prices up. Worth it or not, the list of benefits ascribed to negative ion generators is growing embarrassingly



The Hungarian-made Bion-79 by Medicor is a mains-powered unit.

long. It is hard to believe that these small black boxes can do so much.

They are not a new invention. The Nazis were apparently using them during WWII to keep crews more alert in U-Boats. Throughout the 1920s and 1930s scientists in Europe — in Germany particularly, and in Japan and Russia — had conducted experiments that led some to claim that ions had a pronounced effect on all life forms.

With the outbreak of the Second World War, ion science was suspended

as scientists were put to work devising war machines. After the war, the new sophistication in electronics led already sceptical scientists to disregard earlier ion science on the grounds that the measuring techniques that had been used were suspect. Even now there is a scarcity of studies being done under properly controlled conditions.

Lack of money in the form of grants has also hampered the progress of research into the subject. ▶

Regulations

Negative ion generators have not yet been made a proscribed article in Australia, which would make it mandatory for every model to be submitted for testing and approved before sale. The Energy Authority of NSW is investigating some of the products on the market to see if they comply with the Standards Association of Australia wiring specifications.

The lack of regulations governing ionisers worries some of the distributors, who fear that negative ion generators will become just another gimmick with everyone trying to sell them and make a fast buck. Most concerned is Joshua Shaw. "If you gimmickise ion generators," he said, "we will have the same thing happening here as happened in the States."

In the 1950s the US Food and Drug Administration (FDA) banned the sale of ionisers to the general public. US companies had been commercially exploiting the units as cure-alls and some devices were found to produce unsafe levels of ozone.

Because of its highly oxidising properties, ozone is very effective in neutralising smells and has in the past been misrepresented as being equivalent to "invigorating mountain or sea air". However, ozone is highly toxic and has been shown to accelerate the aging of blood cells. The legal limit allowed by the FDA is 0.05 parts per million, and the FDA still only allows the sale of air

ionisers for environmental, not medical applications.

In Australia, the Commonwealth Department of Health approves air ionisers for personal use. It considers that *they have no scientifically proved benefits but that they present no health hazard.*

It is against the law to make claims of medical benefits in advertisements for ionisers.

This hasn't deterred some distributors. Bionic Products' advertising, for example, claims 85% alleviation of asthma, 70% alleviation of migraines, and 90% alleviation of hay fever and sinus.

In 1979, the Health Commission of NSW wrote to Joshua Shaw warning him to cease making such claims. Shaw ignored the warning. He says he wants to be prosecuted because he's so sure he would win the case.

"Within 24 hours, I'd fly in Dr. Sulman from Jerusalem and Dr. Krueger from California with enough evidence to convince any jury," he said.

Dr. Felix Sulman MD, of the University of Jerusalem, Israel, and Professor Albert P. Krueger MD LLD (Emeritus Professor of Bacteriology at the University of California) are two of the world's most famous ion researchers.

Dr. Sulman's research has centred on the effects on humans of the Sharav — the hot, seasonal wind which blows out of the deserts of the Middle East. The

Sharav is one of the world's notoriously 'evil' winds, known everywhere as 'Witches' Winds'. These include the Santa Ana in California, the Chinook in Canada, and the Foehn in Germany, Austria and Switzerland. Australia, too, has its 'Witches' Winds' — the north winds of Victoria and the westerlies of NSW.

When these hot, dry winds blow they are apparently accompanied by an alarming increase in the incidence of murder, suicide and car accidents, and people complaining of asthma attacks, aching joints, depressions, unbearable tensions or just feeling "under the weather".

What all Witches' Winds have in common is a very high concentration of positive ions. Research done by Sulman and other scientists purportedly shows that an excess of positive ions increases the production of serotonin, an important neurohormone.

Serotonin is a depressant and is associated with sleep, mood and the transmission of nerve impulses. Too much serotonin, it seems, can result in sleeplessness, fatigue, irritability, headaches and dizziness, nervousness, inability to concentrate and a sharp reduction in physical and mental efficiency.

When the Sharav blows, Dr. Sulman found that some people overproduced serotonin as much as 1000 times. Negative ions apparently decrease the production of serotonin in the brain,

HOW A NEGATIVE ION GENERATOR WORKS

This is a brief description of the physical aspects of the operation of an air ioniser or negative ion generator and should not be taken as a rigorous explanation of how they work. Suffice to say that the physics of the process appears to be poorly understood in detail — or is a proprietary secret!

The point

We know from basic physics that a sharp conductor raised to a high potential will have an intense electrostatic field around the point — as illustrated in Figure 1. If the conductor is at a high negative potential, free electrons from the metal will flow towards the point, and if the potential is high enough some will be repelled from the point. The latter will occur because electrons, having a like (negative) charge, will repel one another and the mass of electrons building up behind the conductor's tip will repel those electrons at the very tip. At a certain potential the air will 'break down' and a spark will be seen to emit from the conductor's tip. Catastrophic ionisation of the air occurs, photons being emitted in the process — thus we see a spark along the path of ionisation.

However, at potentials well below the air's breakdown potential, the electrons leaving the tip of the sharp conductor are found to combine with gas atoms and molecules in the air.

Most of the atoms and molecules of the gases comprising the air we breath will have 'vacancies' in the outer electron shell of the free atoms or in

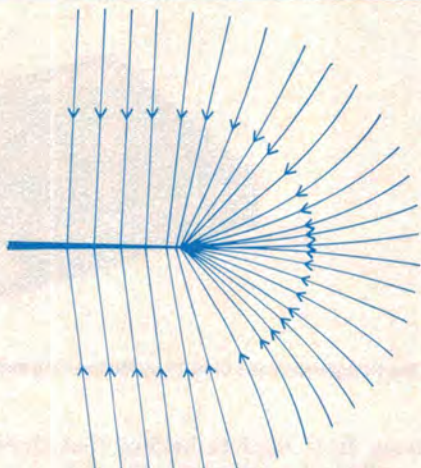


Figure 1. Field around a needle-point conductor raised to a high potential.

the outer electron shell of at least one of the atoms in the gas molecules. Electrons escaping from the conductor will 'fill' these vacancies, giving the atom or molecule to which it attached a net negative charge; this is how they become negative ions.

These ions, termed "small" or "primary" ions, may then combine with other molecules or ions to form larger ions of various sizes and mobility. Research indicates (. . . as all good review papers

say) that it is the small primary ions that appear to be "biologically active", while the larger ions appear to be inert — see Robinson and Dirnfield (1963), Krueger and Reed (1976), Krueger and Smith (1960) and Kranz and Rich (1961).

If, for some reason, some of the atoms and molecules of the atmospheric gases have been positively ionised (that is, they are deficient an electron or two) then the electrons streaming from the conductor's tip will be attracted to the positively-charged ion, neutralising it when they combine.

Again, "research indicates" that an excess of positive ions in the air is biologically deleterious. See Kimura, Ashiba and Matsushima (1939), Sulman (1962) and Sulman et al (1974).

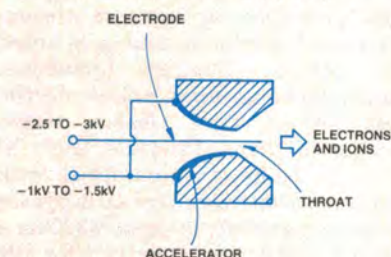


Figure 2. Simplified cross-section of the emitter head of a commercial air ioniser.

Heads

A cross-section (simplified) of the 'emitter' of a commercial negative ion generator is shown in

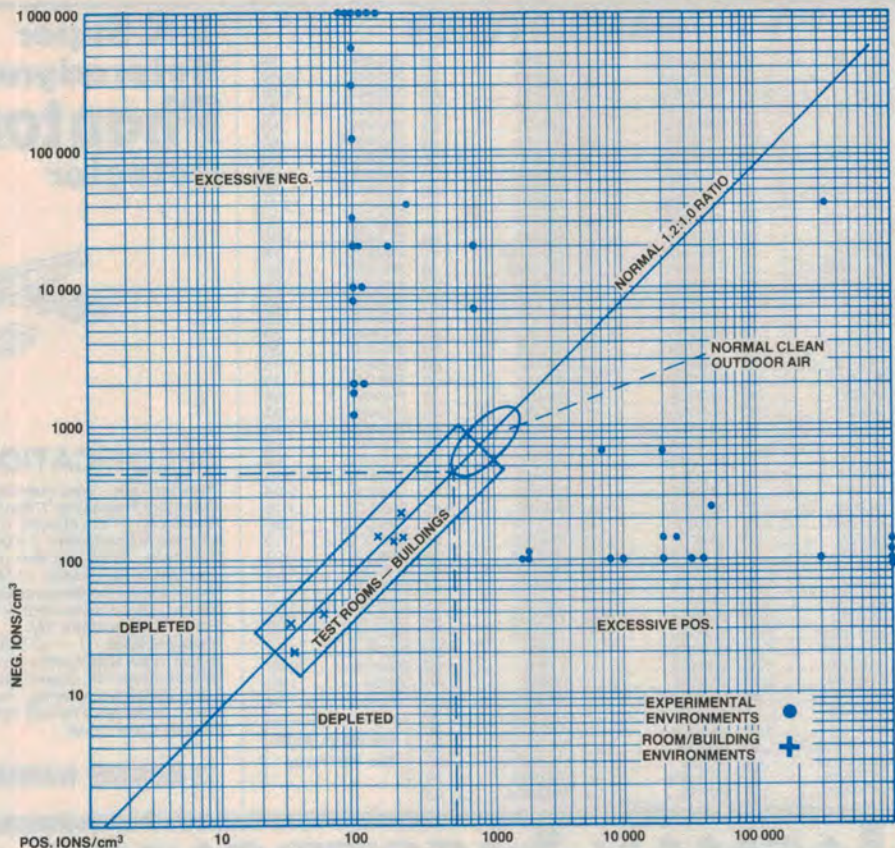
resulting in a calming, tranquillising effect.

Negative ion imbalance or ion depletion is at its worst in cities. For a worthwhile environment there needs to be between 1000 and 5000 negative ions per cubic centimetre, according to various researchers. The average city worker spends his day breathing air with only 200 to 300 positive and 150 negative ions per cubic centimetre. Air pollution in cities quickly depletes or neutralises negative ions, which attach themselves to positively charged pollution particles and lose their charge. This leaves an abundance of positive ions which, along with the pollution particles, are then inhaled.

Negative ions and tobacco smoke

Experiments in the mid-1960s showed that the cilia (microscopic hairs) of the trachea, or windpipe, are stimulated by negative ions and depressed by positive ions.

These microscopic hairs under normal conditions maintain a whiplike motion of about 900 beats per minute while cleaning the air we inhale of dust, pollen, and other matter that should not reach the lungs. Subjected to tobacco smoke, which absorbs negative ions, the cilia slow down; tobacco smoke plus positive ions make this slowing down take place from three to ten times more quickly. This obstructs the ability of the cilia to clean the air that finally ends up in our lungs.



This chart, from a review of the subject by K.R. Robertson of the University of Auckland (see Bibliography), shows "... various types of air ion environments and the relationship of existing research to these environments. Only experiments dealing with humans are presented. The 45° line represents the balanced negative-to-positive ion ratio of 1.2:1.0 across the environments of depleted, normal fresh outdoor, and excessive ion concentrations."

The points and crosses marked on the graph represent measurements of ion environments taken in buildings and test rooms and type of ion environment created in various research designs (base ion count assumed to be 100 +ve and 100 -ve ions per cm³ of air for test rooms).

Figure 2. The 'electrode' has a potential of around -2.5 kV to -3 kV applied. The 'accelerator' has a potential of around -1 kV to -1.5 kV applied. This makes it more positive than the electrode. The shape of the accelerator produces a very complex electrostatic field between itself and the electrode. The apparent object is to 'push' more electrons toward the tip of the electrode. The latter projects well beyond the throat area of the emitter head and the electrons and (negative) ions stream away from the emitter in the direction indicated. Some electrons will accumulate on the flared portion of the throat, giving it a slight negative charge, but this is generally quite small.

The object of the design of the head is to produce a large number of mobile small ions, and as little ozone as possible.

Ozone

There's a drawback that has to be avoided — the production of ozone, O₃. This is a highly reactive form of oxygen that is a good reduction agent or oxidiser and has a known deleterious effect on the mucous membrane and lungs of animals and people if inhaled in quantities above a certain level. (The US FDA sets this level at 0.05 ppm). Ozone is that distinct, acrid, somewhat 'coppery' smell apparent near any continuous spark discharge.

Circuitry

The voltages applied to the emitter are generally derived from a simple Cockcroft-Walton voltage multiplier with input direct from the mains — as shown in Figure 3. The component values used

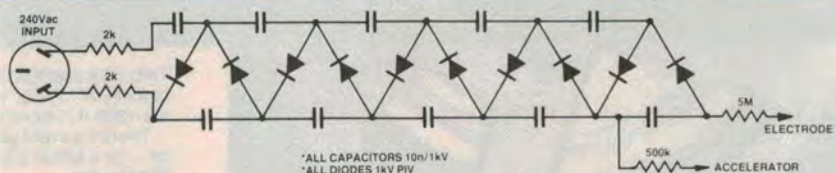


Figure 3. Circuit of a commercial negative ion generator.

and the addition of a high value series resistor between the rectifier output and the emitter's electrode serves to reduce the possibility of nasty accidents if you happen to touch the electrode of an air ioniser — the short circuit current is only tens of microamps. Nevertheless, we recommend you *do not* dismantle one.

The result

What happens, or is claimed to happen, with an air ioniser in operation you can read about for yourself in the numerous research papers. Certainly, the 'coronal wind' produced by one will rapidly precipitate pollutants in the air — particularly those in tobacco smoke. If an air ioniser is operated in one position in a room for some time the surrounding area will become coated in a sticky, dark film of material — which presumably you would otherwise have breathed in. Just why, and how, an air ioniser does this is not clearly apparent.

Trotting out that phrase again, "research indicates" ... that an air ioniser will have a decidedly destructive effect on bacteria. It's controversial,

but this is generally attributed to the ozone produced.

Many claims made of air ionisers relate to 'restoring' the 'natural' balance of negative-to-positive ions. For a machine to do this, clearly, it would need to produce not only sufficient electrons to neutralise the positive ions in the atmosphere surrounding it, but sufficient to balance the ratio as well. As the machines are clearly quite simple at present, no 'feedback' of ion production or negative-to-positive ion ratio is employed, so their effectiveness under variable or uncontrolled conditions must be hard to gauge and their 'control' of the environment crude at best.

If you accept that an excess of positive ions in the atmosphere (as in the 'Witches Winds') can have a detrimental effect on some people, and you believe that an air ioniser has the ability to restore the natural balance of positive-to-negative ions, then you could accept that the machines may have a positive effect (no pun intended).

At this stage, we leave you to decide for yourself.

Roger Harrison.

An article in *New Scientist* for 2 October 1980, entitled "The perils of second-hand smoking", by Sherridan Stock, (pages 10 to 13), said: "Tobacco smoke removes negative ions from the atmosphere, which is already grossly depleted of its natural complement by urban pollution and various other factors associated with modern, man-made environments . . . In recognition of this effect of tobacco smoke, some company executives have installed negative ion generators in their offices and conference rooms."

The article also reported on the effect of secondary smoking (breathing in other people's smoke) on the cilia. Poisoning the action of the cilia by tobacco smoke is believed to facilitate the development of lung cancer by causing the retention of inhaled carcinogens (a substance or combination of substances that can produce a growing cancer from normal cells).

An excess of positive ions in the atmosphere also reduces the body's ability to absorb oxygen and therefore cuts down lung capacity.

Accepting all this, it is then possible to believe that negative ion generators do have a beneficial, if not curative, effect on respiratory ailments. But 'hard' proof is lacking, particularly with respect to the required production and mobility of negative ions to counteract positive ions and pollutants.

Air ionisers in the office

Manufacturers of air ionisers are looking increasingly at the potential market for their products in offices. The combination of air-conditioning, cigarette smoke, synthetic furnishings and large numbers of people in a confined space creates problems in offices ionically speaking.

Hot or cool air forced through duct work of central heating and air-conditioning systems sets up friction that can bring about a reduction of negative ions in the air, according to several researchers. What finally comes out of most heating and air-conditioning outlets in the offices we work in is likely to be an eternal Witches' Wind. To make matters worse, most modern offices are carpeted with synthetic fibre which, as we walk across it, tends to generate a positive charge in the air.

Bacteria thrive in positive ion atmospheres, so besides having to cope with positive ion-induced fatigue, loss of concentration, irritability, tension and headaches, there is also the problem of spreading of disease.

One widely-reported study of the effect of ion-depleted air on office workers was carried out in the New

York Swiss Bank. Between January and March of 1973, at a time when there was an epidemic of 'London Flu', negative ion generators were placed in two working areas of the bank and left running throughout the three-month period. Both areas had 16 people working in them, who were told only that the machines were 'air cleaners'. At the end of the test period it was found that of the 32 employees, only nine were absent for two or more days, and that a total of 53 days' work was lost through sickness. The year earlier (during the same three months) every one of the 32 people was off for two days or more and a total of 89 days of work was lost.

Air-conditioning manufacturers in the States — like Westinghouse, General Electric and RCA — are now designing new systems that increase negative ionisation.

Vehicles

Cars are also said to be ion-depleted atmospheres. Traffic exhaust fumes destroy negative ions, and friction between the air and the vehicle as it is moving sets up a positive charge on the metal bodywork that attracts negative ions to the metal.

A subjective investigation into the effects of ionisation on truck drivers was conducted in Australia in 1979. Drivers from all over Australia were sent a questionnaire to complete. A negative ion generator was installed in each truck and drivers were instructed to make weekly reports.

The results were: 81% of drivers reported an increase in alertness and awareness while driving; 13% could not discern any difference. 80% stated that they slept better and deeper for shorter periods. 73% said they had become less irritable, while 27% found no difference. 93% said they found their cabin cleaner and fresher. 7% failed to comment.

Burns, asthma and negative ions

Dr. Igho Kornbluh of the American Institute of Medical Climatology explored the use of negative ionisers in the treatment of burn patients at Philadelphia's North-eastern General Hospital. After a number of controlled experiments using ionisers in which 57% of burn patients showed improvement, rapid healing and less pain, the entire hospital's post-op wards were equipped with ionisers.

Dr. Kornbluh was also responsible for introducing negative-ion treatment for hay fever and bronchial asthma patients at two major hospitals in Philadelphia. Of the hundreds of patients treated, 63% experienced partial to total relief.

"They come in sneezing, eyes watering, noses itching, worn out from lack of sleep, so miserable they can hardly walk," one doctor said. "Fifteen minutes in front of the negative ion machine and they feel so much better they don't want to leave."

A two-year study of the effect of negative ions on asthmatics is presently in progress in England.

The local scene

We could find no local research efforts into the negative ion question being carried out by independent scientific bodies. However, several of the local air ioniser equipment suppliers said they were carrying out some investigations. Pat Mulligan of Creative Electronics, who markets air ionisers under the aegis of Bionaire International, has spent the past 15 months or so gathering documentation on the subject and is "... keeping a low profile in the market" while his researches continue.

Joshua Shaw of Bionic Products has been doing some work on the construction and operation of air ionisers. He claims to have spent half a million dollars already in funding research. The most recent project financed by his company is an investigation of the size and mobility of ions produced by air ionisers. It seems these are the two most important factors influencing their effectiveness.

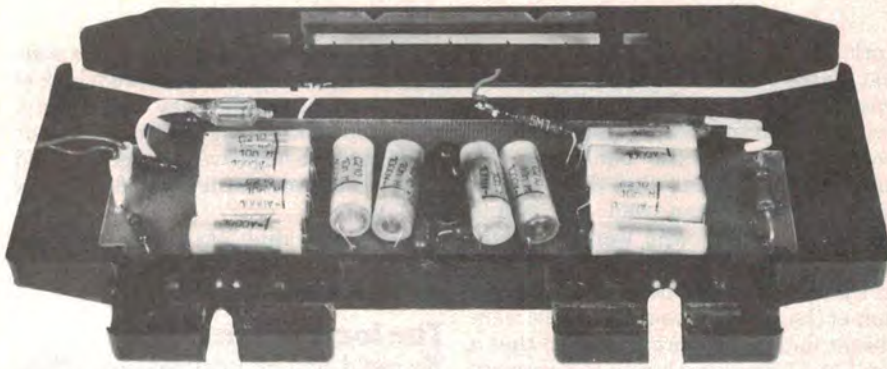
"Ion mobility is one of the toughest nuts to crack," said Joshua Shaw. He is waiting for the results of this latest research before going into generator manufacture himself. Even so, he plans to be manufacturing six models in Australia within a year. In the meantime, he is content to watch sales of his imported models grow higher every day. Since he first started importing two years ago, he claims to have sold 6000 generators.

Shaw first became intrigued by negative ions in 1969 after the presence of a negative ion generator healed a bad burn on his arm. He immediately wrote to the manufacturers to find out more about the machines. Nine years later he brought in his first shipment of generators and he hasn't looked back since.

Bionic Products have six models on the market at present. Two of the most popular products are the Mobilion and Modulion, both made by Amcor — the 'General Electric' of Israel.

The Mobilion is a 12 V car model, the Modulion a room model. It operates from the 240 Vac mains and is claimed to produce an output of 250 billion negative ions per second.

Shaw also imports two models from Medion Limited, a British firm which ▶



Inside the Medicor Bion-79 — simple, isn't it? The basic circuit of this machine appears on page 17.

has been in the ion business for many years. The Medion desk model is claimed to have an output of 5×10^9 to 10^{10} ions per second and an effective range of four to five metres. The Medion portable is claimed to be the only battery-operated unit in the world. Its output and range are similar to the desk model.

Bionic is the only company in Australia, and one of the few in the world, to possess an Atmospheric Ion Analyser (also made by Medion) according to Shaw. The Analyser measures ion charges of either sign independently and the three scale ranges enable density of between 50 and 250 000 ions per cubic centimetre to be recorded. With this, Shaw has tested the effectiveness of all the generators currently on the Australian market. He reports that three of his products gave the following results:

Mobilion — 100 000 ions/cc
(measured at 1m),

Medion — 110 000 ions/cc.

Medion (portable) — 60 000 ions/cc.

Another well-established company in Sydney is Wentworth Electronics. The

director, Ian Maclachlan, has imported, manufactured and sold electronic equipment, particularly electronic health aids, for some years. Since 1977 he has been importing generators from Hungary and has recently started to import from Germany. His range includes desk and car models, a large room unit, appliances for special medical use and a car unit with an electrostatic ceiling strip "designed to produce the same ion conditions in the car as are found outside". Prices range from \$68 for a car unit to \$295 for a specialised medical unit.

Wentworth Electronics claims to have sold over 2000 units.

Bionaire International (Creative Electronics) imports American- and Canadian-made ionisers. They avoid any medical claims and stress only their benefit as air fresheners and purifiers.

Bionaire has three models — the Bionaire 300, a car model priced at \$159, the Bionaire 100-A for caravans (\$169) and a large spherical room model, the 'Ionosphere' (\$159).

Autex International is a Queensland-based company specialising in car

accessories. It markets an American automobile ioniser unit called Air-Alive, which plugs into the cigarette lighter and costs \$139. Autex markets the machine as an air freshener and makes no health claims.

The latest product on the market is a room unit assembled in Australia from American components for Ion Environment Australia of Sydney. Called the Saucer, it is priced at \$136.

The distributors vary in their approach to the product. Some stress health benefits and will only sell directly to the public. Others rely on the benefits of clear and fresh air, and some would like to see ionisers widely sold through retail outlets.

Shaw of Bionic Products believes in a personalised service. "I only sell eyeball to eyeball," he said. He has a small sales team who "know everything there is to know about ions and ionisers". A 12-month guarantee comes with all models. If there are any complaints or faults the company immediately replaces the faulty model or refunds the money.

Gerard Marceau of Belle Lumiere, Australia's only manufacturer of negative ion generators, is one distributor who would like to see generators sold through a wide range of retailers. The company recently ran an intense advertising campaign through electronics magazines and on radio promoting their product, the Aironic.

"We want people to know us so well that when they think of negative ion generators they will think automatically of the Aironic," Marceau said.

The company is also about to launch two new products — a car model and a larger model, twice the size of the Aironic, for industrial use.

Two hundred Aironics are produced each week in the company's Lane Cove (Sydney) factory — and they're going like hot cakes, says Marceau. At \$57 wholesale and \$85 retail, the Aironic is one of the cheapest generators on the market but is also one of the simplest designs; Marceau himself admits than an amateur could make one.

Belle Lumiere moved recently to safeguard their product when they had a 25% import duty on generators introduced in November last year. When asked about this, Shaw of Bionic Products said he wasn't at all concerned. He is more worried about the retaliatory actions of the drug companies who, he says, stand to lose billions of dollars in lost drug sales if the ioniser market keeps growing at its present rate. And according to the ioniser manufacturers, it will happen.

"One day there will be a negative ion generator in every home." ●



The Biotech from Bionaire International is powered from a 12 Vdc source and intended for use in cars, trucks, etc. The makers claim it produces 10 billion ions per second.

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Dee Warring is a 23-year-old New Zealander now living in Sydney. Dee trained as a journalist at Wellington Polytechnic in 1978, specialising in investigative reporting and feature writing. A feature on rape earned her a special prize and was published the same year in a national newspaper. The following year Dee worked as a general and court reporter on a provincial newspaper.

The desire to see another country and expand her career brought Dee to Sydney in January last year. Since then she has been doing some freelance writing for public relations firms. This is the first major article she has had published in Australia.