



Worldwide Newsletter

Issue 25

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Welcome

Welcome to the 25th edition of the **Ambius** Worldwide Newsletter. Since 2000, we have been publishing this newsletter, first as an internal company publication, produced by Rentokil Initial's Research and Development division, but more recently as a newsletter to share with our customers, colleagues and anyone else that is interested in interior landscaping, the plants we use and the benefits they bring.

In this edition, we explain the results of some recent research conducted by the University of Exeter in the UK looking at how plants and art can be used to enrich the lives of residents in care homes for the elderly.

There is also news of some important Australian research looking at how interior plants can remove some pollutants from the air.

Finally, a look at one of the most popular interior plants in the world: the Kentia palm. A familiar plant, but one with an unusual history.

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Two alternatives to Poinsettias this Christmas

This is the time of year that buildings are enlivened with all sorts of seasonal decorations. As well as Christmas trees and garlands, you will probably see vast expanses of poinsettias (*Euphorbia pulcherrima*).

These popular, colourful plants add brightness to their surroundings, but they can be troublesome to keep in perfect condition and some people just get tired of seeing them year after year. So, are there any alternatives?

One plant that you might consider is the *Hippeastrum*, often erroneously called Amaryllis (which is a related species, but not the one you'll commonly find). It is a bulbous plant (grown from a large, onion-shaped bulb) that is often in flower this time of year. Available in a wide variety of colours, this impressive plant is easy to care for.



Another alternative to consider is the Christmas cactus, species and hybrids in the *Schlumbergera* genus. These plants, originally from the cloud forests of Brazil (where they grow in tree tops at altitudes between 1,000 and 1,700 metres above sea level) are also very easy to look after. They can be induced to produce flower buds by keeping them relatively cool (10°C – 15°C / 50°F – 60°F) for 6 – 8 weeks.



Some examples of this species are known to be over 100 years old and they can get very big indeed. A related species, *Rhipsalis gaertneri*, is known as the Easter Cactus and usually flowers during the spring in the Northern Hemisphere.



Enriching the environment of care homes with plants and art

Over the last three years, Ambius has been supporting a PhD research project at the University of Exeter investigating the psychology of office space, the results of which are to be published very soon. A supplementary investigation, conducted alongside the main research on offices has been an examination of the way that plants and art can be used to enrich the lives of residents of care homes for the elderly.



'Jack the treacle eater': a Yeovil landmark, much loved by the residents of the care home.

Starting in the summer of 2007 (and still under way), a series of experiments took place in a care home for the elderly in Yeovil in Southwest England. Here, residents of the care home were moving into new accommodation and we were interested to see whether their use of the communal areas (lounges, dining rooms, etc.) would change if they had a say in the way that the space was decorated.

To test this, four weeks before the move the residents were asked if they were happy in their present surroundings. At the time of the move, residents living on one floor of the home were empowered to have influence over how their social meeting spaces should look (in particular, what plant displays and art they would like), whilst for those living on the other floor, all issues of decor were taken care of by the care home managers. Over several months, residents on both floors were asked a series of questions about how they liked the home, how well they felt and whether they enjoyed living there. Care home staff also recorded use of the spaces and whether there were any changes in the way the residents behaved.

The results, which will be published soon, showed that over the period of the experiment the residents empowered to look after their own social space came to prefer their home much more than residents who had their decisions made for them by a benevolent management. These positive feelings have been sustained over time with no sign of a reduction in the sense of pleasure given to the residents by their living space.

We also discovered that the residents chose plants and art that were very modern, colourful and had striking shapes. This was unexpected as we had assumed that the residents would choose more traditional displays. However, we now believe that the bright colours and strong shapes were chosen because they stood out well against the background and were much more visible than the subtle, traditional designs that were standard practice.

We are grateful to the proprietors and residents of the home, and their families who all gave their full support to the study.





PRISM: Psychological Research into Identity and Space Management

The outcomes of the Ambius-supported PhD research project at the University of Exeter, which has been examining the interactions between work space design, ambience (including the provision and design of plant displays and art), productivity and comfort, are due to be published very soon. The results have proved to be so important that in order for businesses to gain the full benefit, a commercial joint venture between Ambius and the University of Exeter has been set up. PRISM will provide consultancy services and conduct further research in office buildings around the world.

Prism investigates why businesses impose a corporate identity upon employees and why many office workers are prevented from having an input into how their work space looks, feels and is structured. In many work places, managers have traditionally had a strong desire to monitor and control their charges; and this is coupled with an implicit sense that 'designers know best'.

Prism challenges the validity of these concepts and investigates whether they have any unintended consequences.

Prism has begun a programme of ground breaking research in which key elements of work space design and management are systematically varied to measure their impact on measurements of well-being and performance.

So far, Prism's data reveals clear evidence that people who contribute to the design of their own work space perform significantly faster, with no loss of accuracy and report being far more content than colleagues or competitors who are denied their say.

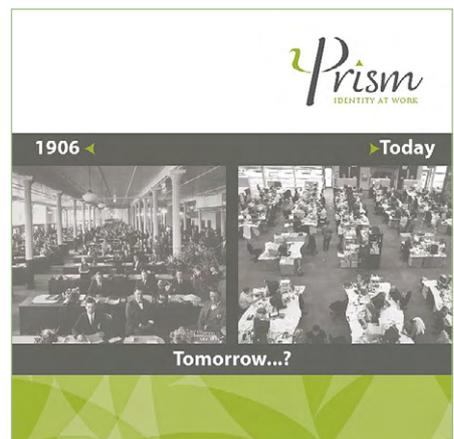
One particularly intriguing finding was that people who helped design their own work space - and who could therefore see something of their own identity reflected in their surroundings - were about 30% less likely to experience 'sick office syndrome' than those whose input was ignored. This strongly implies that empowered workers are much less likely to believe that the office air is contaminated or to complain of headaches or tiredness than colleagues expected to work in a lean office environment.

Recent work in the architecture and design community has highlighted that physical structures and facilities impact differently on diverse groups within organizations. Aligned with findings from our own research, this suggests that performance and well-being are enhanced when space does not constrain identity but instead allows it to be expressed and to develop.

Our research indicates that empowerment and identity are key to well-being and productivity at work.



Improvements are possible within large business settings and Prism is working to translate this research into the development of an optimum model of space management. Through a consultative process, Prism can provide organizations with significant benefits.





New research from Australia

The work of Bill Wolverton, both during his time with the National Aeronautics and Space Administration (NASA) and afterwards, is among the most frequently quoted in plant benefits research. He showed that plants can absorb pollutant gases such as formaldehyde, benzene and trichloroethane, which are released in small quantities by a whole range of materials and human activities. Most of his research on these volatile organic compounds (VOCs) was carried out on plants grown in optimum conditions on a small laboratory scale, which until recently had little support from the scientific community who wanted to see data taken inside real buildings with sensible planting densities, realistic light levels and air exchange rates.

Such data are now being produced and published, not least the work carried out by Professor Margaret Burchett and others in Australia. Their experiments, carried out over the last few years in both laboratories and real offices, have shown that several common species of interior landscape plants have the ability to remove compounds such as benzene and hexane. A significant reduction in concentration of total volatile organic compounds (sometimes by as much as 50% - 75%) has been recorded. What's more, these effects have been observed in offices where planting densities that are both practicable and affordable - indoor jungles are certainly not required.

Removal rates start slowly, but over four to five days rise to more than 10 times the original rate; suggesting that removal is induced by exposure to an initial dose of the VOC. Furthermore, there is a common pattern of removal with all of the species and VOCs tested and, that once induced, the potted-plant microcosm (the combination of plant and soil mixture in a pot) reliably removes additional doses to the original concentration within about 24 hours.

So, what brings about VOC removal? Further testing in laboratory conditions revealed that removal rates were unchanged regardless of whether it was light or dark and that if the plant itself was removed and the soil mixture returned to the test chamber, removal rates were maintained - for a few days at least.

These last two findings led to the researchers to conduct microbial testing of the capacity of the soil mixture for VOC removal, which suggested that it is normal bacteria of the potting mix that are the primary agents of VOC removal, rather than the plant, although the plant has a critical role in ensuring the survival of the microbes by nourishing them around its roots.

Carbon dioxide reduction

Elevated concentrations of carbon dioxide are known to induce drowsiness and the consequent reduction in concentration and productivity. Unless indoor air can be continuously refreshed, human activity in modern, well-sealed buildings can result in surprisingly high levels of carbon dioxide. Plants naturally extract carbon dioxide during photosynthesis and replace it with oxygen, thus reducing carbon dioxide concentrations and increasing oxygen levels. Research to date suggests that bushy plants with a high photosynthetic rate are particularly effective in the presence of light, whereas succulent plants from hot arid areas, especially those in the Crassula family, are more effective at night due to their particular way of assimilating carbon dioxide during the cool of the night.



As a general rule, the capacity of plants to remove carbon dioxide is determined by their ability to intercept light. Factors such as leaf size, overall height, position in the office, orientation of the office, and the position of the sun during the day (or season) are key factors in determining the photosynthetic rates of plants and their subsequent value in buildings.

Precise calculations on the capacity of interior plants to remove carbon dioxide are difficult due to the large number of variable factors. However, using some very conservative estimates, we believe that at least 300g (10 oz) of carbon dioxide (net of that released through plant metabolism) can be removed from the atmosphere for every square metre of leaf surface per year in typical interior conditions. (This equates to approximately 170 litres, or 6 cubic feet, of CO₂ gas) In brighter conditions (such as in an atrium), using the most actively photosynthesizing plants, much more would be possible.

Whilst it may be possible to use such a fixation of carbon as part of a measured carbon footprint reduction programme, there are a number of caveats and confounding factors to include in the calculations, such as the complexities of calculating a full lifetime analysis of carbon assimilation by the plant, against the resources used during its growth and preparation for use as an interior landscape plant and its subsequent disposal at the end of its life.

So powerful are the new data on VOCs and carbon dioxide that the researchers confidently assert that ...

“... to ensure sustainability of the urban environment, satisfying the ‘triple bottom line’ of environmental, social and economic considerations, it is expected that indoor plants will become standard technology - a vital building installation element, for improving indoor air quality.”

Effects of three potted-plants (floor specimens of *Dracaena* ‘Janet Craig’) on levels of CO₂ and CO (ppm) in office air, in an air-conditioned and a naturally ventilated building (n > 50 offices / treatment).

Air conditioning	No. of plants	Mean [CO ₂] ± SE (ppm)	Mean [CO] ± SE (ppm)
Yes	0	409 ± 6.2	0.225 ± 0.035
Yes	3	366 ± 7.3	0.017 ± 0.008
No	0	386 ± 17	0.071 ± 0.024
No	3	290 ± 15	0.010 ± 0.005

From: **Use of living pot-plants to cleanse indoor air - research review**

By: Jane Tarran, Fraser Torpy and Margaret Burchett
Faculty of Science, University of Technology Sydney (UTS), PO Box 123, Broadway, NSW 2007, Sydney, Australia

In: Proceedings of Sixth International Conference on Indoor Air Quality, Ventilation & Energy Conservation in Buildings – Sustainable Built Environment, Oct 28 - 31, 2001, Sendai, Japan, Volume III, 249-256



Ambius white papers

*Through building knowledge and identifying excellence, **Ambius University** will develop tools and provide support, which will empower all colleagues to deliver a consistent service experience to our customers that lives up to the **Ambius** vision, mission and values.*

Ambius University Mission Statement

Ambius University's functions, as expounded in our Mission Statement (left), include building knowledge and developing tools for the business. Part of that mission is being achieved with a research programme that conducts or identifies relevant research and presents the findings in such a way as to be useful to both customers and colleagues alike.

Last month, we published the first in a series of **Ambius** White Papers. These are publications aimed at key influencers, such as senior executives, journalists and professional associations and are designed to educate and inform the readers.

Plants in Green Buildings is an in-depth report about how interior landscaping can and should be used as part of a recognised green building management system. Future publications in the series will focus on plant benefits research, the use of interior landscaping as a space management tool and multi-sensory interior landscaping (including art and scent). If you would like a copy of *Plants in Green Buildings*, please contact the author, Kenneth Freeman, by e-mail (kenneth.freeman@ambius.com) or download it from www.ambius.co.uk/learn/white-papers.aspx.

Future papers in the series will cover recent research into the psychological benefits of plants, how interior landscaping can be used as a cost-effective space management tool and how ambient fragrances can be used to enhance the ambience of commercial buildings.





Plant profile: Kentia palms

The Kentia palm (*Howea forsteriana*) is one of the world's most popular indoor plants - and with good reason. They look elegant and striking at the same time, their lush dark green foliage complements any decorative style and they are very easy to look after. Despite their ubiquity, Kentias add a touch of class to any interior setting. They also have a fascinating story to tell.

Kentia palms are native to one tiny island in the whole world. An exquisite, remote island some 700 km north-east of Sydney, Lord Howe Island is a lonely and exotic outpost in the vast Pacific Ocean. It is in this unique and isolated environment that the world's best selling decorative palm thrives.

Lord Howe Island was settled in the early 19th Century and acted as a supply station for the whaling industry. As whaling declined, a new source of income was required. To begin with, the islanders tried to sell their produce, but it was the local palm (*Howea forsteriana*), which they used to thatch their houses, that saved them.

Lord Howe Island has a mild, balmy climate and this allowed the Kentia to evolve into a plant that can tolerate indoor conditions. It is also a very beautiful and elegant species and it is this combination of hardiness and looks that caught the attention of Victorian plant hunters over 100 years ago. The species first reached Europe in 1772, thanks to the efforts of the Forsters, a father and son team of German naturalists who sailed with Captain Cook on his second voyage to the Pacific islands.

How the plants are grown

Until the 1980s, only seeds of the Kentia palm were sold to commercial growers around the world. Now, however, only small trees and pre-germinated seeds that have been grown and nurtured on Lord Howe Island can be sold. This means that all the plants sold commercially around the world are grown from seeds gathered from wild plants that have been growing in their natural environment. Each palm can produce as much as 7 – 8 kg of seed a year.

Once the seeds have been collected, they are germinated on the island's nursery in sterile conditions. Each growing unit is sealed to protect it from pests or diseases before it is ready to be exported.

Within 1 day of packing and certification, the little seedlings are flown to commercial nurseries all around the world where they are grown to commercial size before being sold to interior landscapers, gardeners, florists and garden centres.

Where the Kentia palm is used

The Kentia palm is most often found in its juvenile, bushy form, which is often best displayed on its own in decorative containers where its elegant form can be highlighted. In this form, it is tolerant of quite low light levels. However, large specimens with fully-developed trunks can be used in well-lit atriums as the centre-pieces of large plant displays. The durable nature of the plant makes it suitable for use in almost every indoor environment, including around swimming pools.





News from **Ambius**

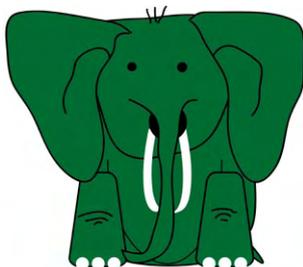
Oasis of the Seas

Denise Eichmann and the **Ambius** USA Project Development Team, assisted by colleagues in the **Ambius** Northern Europe Region, have succeeded in winning a contract to install and maintain an amazing landscape project on the brand new Oasis of the Seas cruise liner, operated by Royal Caribbean Cruise Lines.

The centre of the ship, and that of its sister vessel, Allure of the Seas is open to the sky and features a huge tropical garden (over 2,000 square metres, or a little over half an acre), known as Central Park (an artist's impression of the space is shown here). This area will be home to thousands of small plants, shrubs, climbers and specimen trees, all planted in more than 1,100 specially-fabricated planter boxes. The plants will be planted during the ships first crossing from its shipyard in Finland to its home port in Florida, ready for its maiden voyage around the Caribbean.



Big Green Elephant



The Big Green Elephant symbolises the issue of the **Ambius** environmental footprint, especially the company's carbon footprint. Commercial, legislative and ethical pressures mean that reducing our impact on the environment has become a priority.

Ambius will start to measure its carbon footprint during 2009 and develop ways by which our environmental impact can be reduced. We will then communicate the means and benefits to colleagues, customers, suppliers and the wider community.

A measured and recorded carbon footprint will enable **Ambius** to participate in a greater number of tenders and enhance our reputation as experts with our customers.

New **Ambius** divisional head office

Following our global re-branding programme, a new head office for **Ambius** has been established within the existing North American business in Chicago, USA. In Chicago, we have the greatest concentration of resources needed to support our overall global strategy. However, **Ambius** is a business based on successful teams of colleagues working together all over the world, as such, international boundaries have become less relevant. **Ambius** is fully committed to developing expertise and talent in all of the **Ambius** businesses, in Europe, North America and beyond.

During December, **Ambius's** Managing Director, Jeff Mariola, will relocate from the UK and will establish his office in Chicago from where he will manage the company. **Ambius** remains a division of London-based Rentokil Initial plc.

Contributions Please!

Contributions are welcome from our readers around the world. If you don't have time to write at length, send us brief notes or telephone us and we'll prepare an article for you.

Remember, if you want a swift reply to a tricky technical question, send an e-mail to the editor and we will do our best to answer it.

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