

# 3M ESPE launches the supreme composite

By Joseph Allbeury

**A**esthetics is one of the key driving forces in dentistry today. A renaissance in realising the beauty of the human dentition is being driven by both patient and dentist alike and new restorative materials to this end are constantly evolving. New developments in composite resin technology, in particular, are allowing dentists to cost-effectively deliver unprecedented aesthetic excellence under all indications.

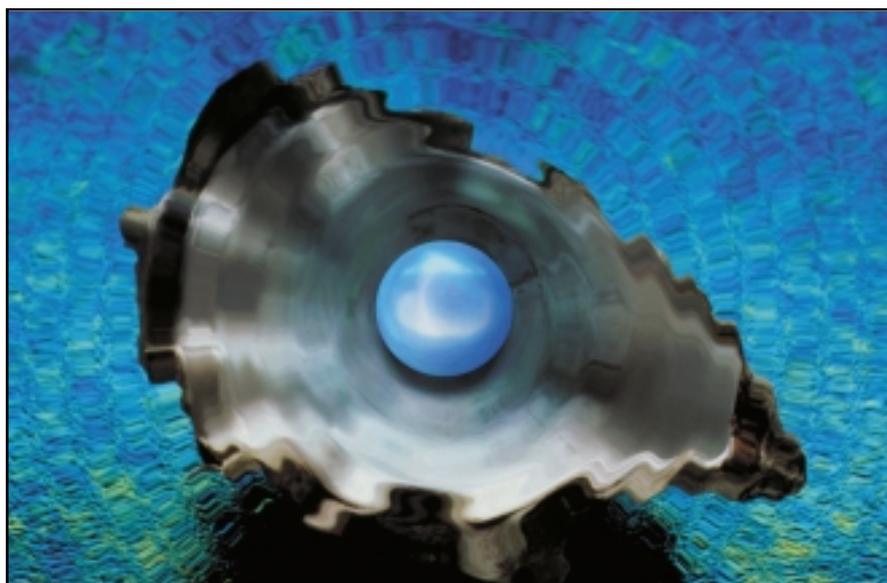
To date, however, composites have generally been divided into two types, microfills and microhybrids. The former are generally more polishable and have better polish retention in the long term, making for better aesthetics, but tend to lack the strength of the microhybrids, which conversely do not polish as well.

3M ESPE believes it has solved this conundrum with its new composite, Filtek™ Supreme Universal Restorative, which utilises nanoparticle (very small particle) technology (see inset) to deliver a product that is truly universal, combining the sheer beauty of a microfill with the strength of a microhybrid.

This article presents the views of several leading dentists who have been involved in the evaluation of Filtek Supreme prior to its release in the United States and Canada for up to a year, including those who were members of discussion groups which reviewed key features of the product and also dentists in Australia who have been part of a pre-market launch evaluation since late 2002 when TGA registration was received.

## Initial indications

“Nanotechnology is brand new to



dentistry,” says Dr Douglas Lambert, a private practitioner in an 8-chair group practice in the upper class Minneapolis suburb of Edina. “It’s been used a lot in a number of other industries and one of its advantages in composite resins is that it is able to offer the melding of the polishability that we demand for the anteriors with the necessary physical properties for the posteriors. It literally gives us the best of both worlds.

“I currently use it in all types of restorations, classes I-V plus veneers. There’s nothing in the scope of my practice that I wouldn’t use it for.”

“Microhybrids are traditionally strong but don’t maintain their polish long-term,” explains Canadian dentist and international aesthetics lecturer, Dr George Freedman, who started using Filtek Supreme in May as part of pre-release trials.

“Microfills are more polishable and have better polish retention, but wear more quickly. Up until now, you had to make a choice with Class IVs: do I make it look good, or do I make it last?”

“With Filtek Supreme, it’s a different technology. It polishes well with good retention and is also very strong.

“So far, the recalls look fine. Six months on, it’s doing everything it’s supposed to do and retaining that same shine achieved at placement.”

“I would go so far as to say that from the moment you dispense the composite from its compule onto the tooth surface, you have this feeling that you are dealing with something quite special,” says Brisbane-based (Australia) Prosthodontist, Dr Michael Mandikos, who has been using Filtek Supreme since November.

“You get a real, true-to-life tooth colour from the material,” says Castle Hill,



Before and after: Cervical abrasive lesions using Filtek Supreme.  
Photos courtesy of Dr Calavassy

NSW, dentist Dr Sam Guirguis. "Done right, it's virtually undetectable from actual tooth structure."

"The shading system is excellent with exceptional dentine, body, enamel and translucent shades," says Dr Guirguis' partner, Dr Fred Calavassy, "making the product exhibit true chameleon-like properties."

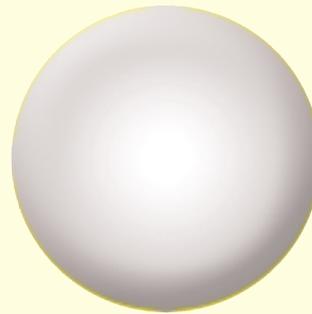
Chicago-based dentist, Dr Alan Boghosian, has been using Filtek Supreme for over 12 months, commencing with prototype versions of the material. The solo practitioner, whose practice is largely restorative-based, is an Assistant Professor at Northwestern University's Feinberg School of Medicine, conducting clinical research into dental materials and intends commencing a clinical trial of Filtek Supreme in the near future.

"Filtek Supreme is a great material,"



he tells. "It's highly versatile, both in its use anteriorly and posteriorly and very versatile aesthetically with multiple translucencies to essentially accomplish whatever you would want in any number of layers from one to multiple."

## Nano technology made simple



1 Micron



100 nm



75 nm



20 nm

1 Micron = 1,000 nanometres

The 3M ESPE Filtek Supreme Universal Restorative is designed to offer excellent strength and aesthetics for all anterior and posterior restorations. In this regard it is perhaps the first truly universal composite material to combine the strength of a hybrid with the beauty of a microfill. In order to accomplish this task, Filtek Supreme universal restorative, was created using two fillers: nanoparticles and nanoclusters. The nanomer particles are individual filler particles, roughly spherical in shape.

Nanoclusters are loosely agglomerated collections of nanoparticles. The dentin, body, and enamel opacities of Filtek Supreme universal restorative contain primarily nanoclusters. In these opacities, nanoparticles and nanoclusters are made with individual particles of only 20nm in diameter. Radiopacity is assured by the inclusion of silica zirconia nanoclusters.

The translucent shades of Filtek Supreme contain predominantly individual nanoparticle for the ultimate in polish retention. These unique particles also allow unprecedented control over the degree of transparency of the incisal shades. Both nanoparticles and nanoclusters are made with silica nanoparticles of 75 nm in size.

The unique combination of nanoparticles and nanoclusters were chosen to impart the best of both aesthetics and user-defined handling to the new composite. From the standpoint of polishing, the nanocluster acts more as discreet particles in the size range of only 20 or 75 nanometers (0.075 micron) in diameter, much lower than typical micro-hybrids with average particle sizes from 0.4 to 0.6 microns.

From the standpoint of manipulation, the use of nanoclusters enabled 3M ESPE to tailor the handling to match the desires of the initial evaluators. Nanoclusters allowed the company to incorporate the handling of a hybrid into a product with the polish of a microfill.

Filtek Supreme restorative is not a microfill. Most microfills are composed of a mixture of resin and prepolymerized resin/filler. This prepolymerized resin/filler mixture is difficult to bond to, which, by affecting physical and wear properties, limits the indications for microfills to areas where aesthetics are the overriding concern. With Filtek Supreme restorative, both nanoparticle and nanocluster fillers are combined directly with the proprietary, reduced-

(Continued on next page)

“Optically speaking, it’s definitely one of the best materials on the market. Its physical properties, in terms of what we can measure in the laboratory, puts it on par with what materials at this point in technology should reflect with a composite, especially in the posterior. So you have issues on strength and beauty covered.”

**Development**

3M ESPE spent some four years in developing Filtek Supreme at the company’s St. Paul, Minnesota, USA, laboratories. The nanotechnology used in the product is also used in a range of other industries including medicine, computing, manufacturing, biotechnology, automobiles and home appliances.

While the ability to deliver a dramatically reduced “nano” particle size is new to dentistry, the product draws on past successes in 3M ESPE’s long history of dental product development.

The resin system, for instance, is the same reduced shrinkage resin found in Filtek Z250 MicroHybrid Restorative and Filtek P60 Posterior Restorative.1

“I’m a practising dentist, so consequently I’m not set-up to verify aspects of the product like compressive strength,” says Dr Lambert. “So I have to rely on the company’s data. 3M ESPE is a company we can trust and I look at who they’ve used to test these features, which dentists have been involved in its development and from past experience, I know that in the case of Filtek Supreme, that I can rely on the information that is being published.”

**Shade range**

A key feature of Filtek Supreme is the range of shades and opacities available. Six shades in the Dentine opacity; 12 in Body; six in Enamel; three in Translucent; and a further three specialty shades allow the dentist to achieve maximum aesthetics under all indications.

“Filtek Supreme is the first system to be developed from a colour-based perspective and it gives dentists the

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shrinkage resin, their formulation akin to that of a universal or hybrid composite - not a microfill. This ensures that Filtek Supreme restorative retains the superior mechanical properties and wear resistance typical of hybrid composites. The filler loading, critical for performance, is also limited with microfills, typically reaching 50-60% by weight. Filtek Supreme restorative dentin, body and enamel shades are filled to 78.5% by weight, while the translucent shades are filled to 72.5% by weight.

3M ESPE has created a new generation of universal composite. The nanosized filler particles used in Filtek Supreme restorative allow the polish and polish retention typical of a microfill, yet the handling, strength and wear properties are excellent allowing truly universal indications. The unique range of shades and opacities allows excellent results with either single or multi-layer restorations.

This section on nano technology was supplied courtesy of members of the 3M ESPE Restoratives Business Team including Jon Fundingsland, Scientific Affairs; Mary Doruff, Technical Service; Brian Holmes, Product Development; Dong Wu, Product Development.

choice of how aesthetic they want to be,” says Dr Freedman. “It’s not so much how many shades you have, but how adaptable they are.

“Filtek Supreme has a complete shade range but it is its multi-aesthetic capability where it shines. It allows the dentist and the patient to ‘coincide’ their aesthetic needs perfectly.



Before and after: Three layer build-up of a canine into a lateral incisor using Filtek Supreme Dentin, Body and Enamel shades.

*Photos courtesy of Dr Mandikos.*

“You can deliver aesthetics at three different levels: single shade, two shade, and multi shade, with this product and you can cater to the needs of the patient and the position of the tooth in the mouth.

“For me, the availability and versatility of the range of shades is the major differentiator between Filtek Supreme and other composites on the market.”

Dr Mandikos is also more than happy with the number of shades available with Filtek Supreme, however, he believes the actual quality of the shades is where the product shines.

“3M ESPE have really done their homework with the opacity of the various shades and if you put these colours in the right place and sequence, the colours have the right opacity for each depth to get a good result easily.

“Each shade has an appropriate opacity in terms of matching natural tooth structure. We generally consider three aspects of shade matching - the Hue, Chroma and Value. The fourth dimension of shade selection is translucency, and getting this right can make a significant difference to the overall result. My experience with Filtek Supreme is that they’ve really taken translucency into

### Filtek Supreme Shades

- **Dentin opacity (Highest opacity):**  
A2D, A4D, A6D, B3D, C4D, C6D
- **Body opacity:**  
A1B, A2B, A3B, A3.5B, A4B, B1B, B2B, B3B, C1B, C2B, C3B, D2B
- **Enamel opacity:**  
A1E, A2E, A3E, B1E, B2E, D2E
- **Specialty shades:**  
WE (White Enamel), WB (White Body), WD (White Dentin),
- **Translucent opacity:**  
V(iolet), G(ray), Y(ellow)
- Shade selection is accomplished referencing the VITAPAN(r) classical shade guide.

account. This facilitates either a one shade build-up or the layering technique for restoring anterior teeth.

“If your preference is to use one shade in a Class III case, the Body shade gives you an excellent match and a more

chameleon-like effect because its opacity is more “tooth-like” than most other general purpose composites. . In a typical Class III cavity, you can use the Body shade on its own and it’s fine, but if you then support it with a bit of the Dentine

shade underneath, it improves the opacity a lot more and you get a much better result. You find that you quickly learn how much Dentine and Body to use and it boosts your confidence. Before you know it, you are doing multi-layered restorations.

“I don’t normally do multi-layered restorations in the posterior, but even with one shade, you can get a good aesthetic result. Even in a shallow cavity with a dark dentine floor, the Body shade usually has a high enough opacity to mask enough of that darkness out to provide a nice outcome. The Dentine shades are even better at doing this.”

According to Dr Boghosian, Filtek Supreme is one of the few multiple translucent materials on the market where you are able to just plug in the body shade and end up with wonderful optical

### Multiple shade restorations made easy

Filtek Supreme includes shades in four different opacities - Dentine, Body, Enamel and Translucent. Each opacity includes multiple shades to deliver maximum aesthetics under all indications.

For dentists not well-versed with the use of more than one shade in a restoration, Filtek Supreme’s more than a dozen Body shades will generally deliver the optimum result in a single shade restoration.

However, to achieve maximum aesthetics, particularly in the anterior, the addition of a second or even multiple shades can achieve outstanding results. To fully mimic the structure of a natural tooth, a restoration could commence with a layer of Dentine, ideal for blocking out any discolouration, followed by Body, Enamel and finally Translucent.



To help encourage and guide dentists in multi-layering techniques, 3M ESPE developed a unique shade selection wheel to assist dentists in shade choice. The shade selection wheel corresponds to standard Vita shades. If, for example, you decide the restoration should be filled with shade A3, you dial the colour wheel to A3 and receive a single shade recommendation of Filtek Supreme A3B - the B stands for Body opacity. The Two shade recommendation is a layer of A3B followed by a layer of A3E (Enamel). The multi shade recommendation is A4D (Dentine), then A3B, then A2E and finally the Translucent shade Y.

Experimentation with the thickness of each layer will be required to achieve the best results but experience over time will speed up results.

“For dentists who haven’t used multiple shades before,” says Dr Lambert. “The best way is to jump in and try it and have confidence in your own abilities.

“The shade wheel is a good starting place and so are mock-ups - placing the composite on as a veneer and curing it without the etch and the bond - on a dry tooth.

“To mock-up, simply dry the tooth with a gauze, put on the first layer, cure, put on the second layer, cure, then the next, etc. Then stand back and look. (Continued on next page)



## USER REPORT

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“Don’t dry the tooth too much as it may desiccate and change colour.

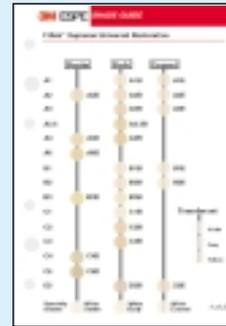
“If you decide it needs more opacity, you’d pick it off, re-moisturise, dry and start again.

“You may do it three or four times before you get the right combination.

“Once you have come up with the correct recipe, you pick it off, etch, bond and go for real.”

Explains Dr Boghosian, “first you examine exactly how much tooth structure is missing and make a rough determination of shades. Then take a look at the shade selection wheel and see what combinations would best be suited for this. At that point, it’s a start. I’ll lay down one of the more opaque materials and then build on top of that to see if the outcomes in the layering scenario, without etching, without bonding, would give us that dead bang look to that of the adjacent teeth, so that it matches.

“If it doesn’t, I may modify it, you may find out that in thicker cases, starting with something a little darker, may not work as well. We may go from an A3 to an A2 which, in thicker layers, will appear darker. You make your mistakes without having to rip things off the tooth after they’ve been etched and bonded.”



properties.

“There are certain cases where it is impossible to do layering and if you are using a material that is too opaque, then it’s not going to mimic the adjacent enamel very well,” he continues. “If it’s too translucent, you’re going to get shine through, so using the body shades, which is a happy medium, really melds with the remaining tooth structure to give you the look you want.

“That’s the versatility of Filtek Supreme - 1, 2, 3 or 4 layers.”

Dr Calavassy typically uses two shades on posterior restorations. “With the anteriors, however, you need the whole armamentarium of shades, plus staining to get what you need, especially in paediatric restorations where there can be any multitude of shade combinations. On Class IV restorations the opaque dentine shades perform the task they are supposed to, giving excellent blackout characteristics and with the selection of further body and enamel shades the restorations can be made undetectable.”

“You become very familiar with the shades and the colours and very adept at working with them,” says Dr Guirguis. “You need less stock and there are less choices to make - it’s no longer what material are you going to use, it’s only which shade.

“You attain true life tooth colour results from the material.”

### The shade selection wheel

The aesthetic capabilities of Filtek Supreme and the range of shades and opacities available make the material ideal for single shade or layered build-ups to achieve a restoration that mimics natural tooth structure.

With such a range of combinations, however, 3M ESPE has sought to simplify the selection process by designing a shade selection wheel that provides recommendations for one, two and multiple shade restorations (see inset).

“I initially thought the colour wheel was a bit of a gimmick when I first saw it,” jokes Dr Calavassy. “But it is actually a very useful tool and makes shade selection far easier. Shade tabs in my opinion are basically useless because they don’t mimic the material. The Filtek Supreme shade selection wheel is very accurate and it works well.”

Dr Calavassy said that he used the shade selection wheel for the first dozen or so restorations while his partner, Dr Guirguis, actively uses the tool on a daily basis.

“You get to know the relationships between the shades fairly quickly using the wheel,” says Dr Calavassy.

“The shade selection wheel is going to be a very valuable tool for people who may not be so versed in layering composites,” says Dr Boghosian. “It will give them an idea about combinations and

pairings of usage from anywhere between one material to essentially all of them combined to give you the effect that you are looking for.”

The shade selection wheel provides an easy solution to shade selection but cannot predict how much tooth structure is missing and thus the thickness of the ultimate restoration. Dr Boghosian and several of the other dentists interviewed use mock-ups of the restoration, that is, the placement of a trial restoration without etch and bond, to ensure the desired effect is achieved.

“There are a lot of variables,” continues Dr Boghosian, “but with this tool, you are headed down the right road, more so than you have been with many other systems available on the market today.”

“There’s enough colours in Supreme’s range for a dentist who uses just one or two shades to find what they need as well as someone who uses multiple shades,” says Dr Lambert.

“The idea of the shade selection wheel allows a dentist who is only a single shade user to be able to experiment with a second or multiple shades with no risk.”

### Handling

The science of Filtek Supreme promises much, however, on a practical level, dentists also look at a number of other issues when choosing composite. A key

factor is handling.

“To some degree, handling is personal preference,” says Dr Boghosian. “So if you’re asking me do I like the way it handles, the answer is yes. But it’s like anything, some people would prefer a dead soft microfill-like material; others want it very stiff. Filtek Supreme is somewhere in the middle which allows you to ‘swedge’ the material rather nicely for anterior layering techniques and for the posterior, it also has enough body to keep its form and to stay in place, especially in the necessary aspects of getting good contacts.”

“It’s non-slumping and you can build up cusps easily,” confirms Dr Calavassy. “Handling is personal, and for me, it could be a fraction stiffer for posterior applications, but as a universal, its properties are ideal. Importantly, it’s not sticky and very easy to use well.”

“It has good adaptability to the margins and you can sculpt it to the shape you want and it will retain that form without having to rush to cure it. You can characterise an incisal edge easily.”

“The translucent shade is very stiff,” says Dr Mandikos, “but the other shades handle very well. It doesn’t slump and it doesn’t stick to the instruments and it has sufficient resistance to packing that it’s easy to use posteriorly as well.”

“It’s a good compromise between being too flowable and too rigid or stiff,” says Dr Lambert. “It’s a good middle ground for a product that is trying to be truly universal.”

### Polishability

The very small size of Filtek Supreme’s filler particles allow it to be polished very easily and effectively and also similarly ensure the polish will be retained.

“It’s a material that can be shined faster and easier than many composites on the market,” says Dr Boghosian. “You can almost polish it to a shine that is greater than some adjacent enamel.”

Dr Boghosian uses traditional finishing and polishing methods, contouring

with fluted carbides.

“If I’m developing some uniform levels of incisal edges, I’ll default to aluminium oxide discs like Soflex, and I will polish material with aluminium oxide polishing paste in a prophy cup and that brings out an extremely high shine that is sometimes better than the adjacent enamel.”

Dr Calavassy also uses 3M ESPE’s Soflex discs and finishing brush and silicon impregnated rubber wheels for ultra-high polish.

“The polishability is absolutely amazing,” he says. “No question about it. It easily polishes as well as a microfill. We’re using Filtek Supreme for both anterior and posterior restorations, but you really see the maximum benefit of its aesthetic properties in the anterior. Even the patients comment on the results.”

### Universal benefits

From a business and work flow perspective in dental practice, using a composite universally also has a number of benefits.

“Put simply, using one material for both the anterior and posterior makes life easier,” says Dr Guirguis. “You need to carry less stock which helps the staff immensely, as well as reducing costs. It’s a great advantage to be confident with the different colours and shades available and how they will look when they are placed.”



Before and after: Amalgam replacements with Filtek Supreme.  
Photos courtesy of Dr Guirguis.



Photo supplied courtesy of 3M ESPE

“We used to use a combined microfill/microhybrid for anteriors and a microhybrid for posteriors. Now we’re using Filtek Supreme for both. It polishes like a microfill and the results in restorations like a Class III, IV & V in the anterior region are superb.”

“The thing I like is that you can use it for anteriors and posteriors,” says Dr Calavassy. “We’ve never been able to do that before. We’ve always used a split system. You can use Filtek Supreme universally and it has excellent wear resistance, strength, polishability and colour range.”

### First recalls

The translucent shades of Filtek Supreme predominantly contain individual nanoparticles designed to ensure long-term polish retention. Any wear of the surface of the restoration will typically only dislodge an individual microscopic nanoparticle which will not affect the overall polish. Simulated testing of wear factors after five and 10 years by 3M ESPE have shown that the polish will be retained in the long term.

“So far, I’ve seen the six month recalls and the results are just gorgeous,” says Dr Boghosian. “The polish retention is exceptional, especially when the translucent shades are used.”

Dr Freedman and Dr Lambert reported similar promising results after the first round of recall appointments.

“It’s the actual physical properties of Filtek Supreme that allow it to take on a polish that will not only look good the day you place it,” says Dr Lambert, “but

hopefully years into the future. The restorations we did in January and February 2002 have been back for recalls and we are seeing the same polish being sustained as when the filling was done. It's very encouraging."

"We haven't been working with the material long enough to see the first recalls," says Dr Calavassy, "but we have seen patients over a number of months during ongoing treatment who have Filtek Supreme in their mouths, and so far, the polish retention is excellent and as a result, hasn't picked up any stain. I would also expect plaque retention to be less over time as a result."

### Conclusion

"I'm always skeptical about new products," says Dr Lambert. "If I'm going to change, I want to make sure it's not a step backwards. Every dentist has a cupboard full of products they never use. A universal composite is the dream and Filtek Supreme is the closest thing I've found on the market to being truly universal. And you want that in a product that's forgiving and not too technique sensitive. There's now nothing in the scope of my practice that I wouldn't use it for."

"3M ESPE have done their job to produce a world class material," says Dr Boghosian. "If you want to bring out the absolute finest that can be achieved with aesthetics, mimicking natural tooth structure, I would highly encourage everyone to seriously consider Filtek Supreme as the next evolution in terms of composite, restorative dentistry." DA

### Reference

1. 3M ESPE Filtek Supreme Universal Restorative System Technical Product Profile 2002

*Joseph Allbeury is a journalist and editor based in Sydney, Australia. He has written hundreds of articles on all aspects of dentistry which have been published worldwide. This article was published in the Australasian Dental Practice.*

## About the dentists interviewed

### Dr Alan A. Boghosian, DDS



Dr Alan A. Boghosian is Assistant Professor of Clinical Surgery in the Division of Dental Surgery of the Department of Surgery, at Northwestern University's Feinberg School of Medicine where he coordinates clinical research investigations. He has authored numerous publications and has lectured internationally on the subjects of dental materials and restorative procedures. Dr Boghosian is a member of the International Association of Dental Research and a Fellow in the American College of Dentists and Academy of Dental Materials. In 1996 he was the recipient of the Gordon J. Christensen Recognition Lecturer Award of the Chicago Dental Society. He formerly was chairman of the working group on materials, instruments and equipment of the Council on Scientific Affairs of the American Dental Association and currently serves as a consultant to the council. Dr Boghosian maintains a private practice in downtown Chicago devoted primarily to restorative dentistry.

### Dr Alfred Calavassy, BDS



Dr Calavassy received his B.D.S. (Bachelor of Dental Surgery) from Sydney University in 1989. He was an active member of the part time teaching faculty in the early 1990's being involved in the undergraduate fixed prosthodontic, tooth conservation and oral health courses. He was a Clinical Associate in 1995 and commenced his own practice in 1997. He is a graduate of the prestigious Las Vegas Institute for Advanced Dental Studies and continues to further his knowledge through continuing education both locally and abroad. He maintains a private general practice in Castle Hill, NSW with his partner, Dr Sam Guirguis, which is centred around comprehensive aesthetic rehabilitation.

### Dr George Freedman, DDS



Dr Freedman received his DDS from McGill University in Montreal, Canada in 1978. He is the Director of Post-Graduate Programs in Esthetic Dentistry at State University of New York (SUNY) at Buffalo, University of California at San Francisco (UCSF), and University of Missouri (Kansas City). Dr Freedman is a Founding Member, past President, and Fellow of the American Academy of Cosmetic Dentistry, and a Fellow of the Academy of Dentistry International. He is the author of *The Color Atlas of Porcelain Laminate Veneers* and *The Color Atlas of Tooth Whitening* and has published extensively. Dr Freedman lectures internationally on dental aesthetics, high tech dentistry and oral photography. He maintains a private practice in Toronto, Canada.

### Dr Sam Guirguis, BDS, FRACDS, FICDDE



Dr Sam Guirguis received his B.D.S. (Bachelor of Dental Surgery) from Sydney University in 1989. He was an active member of the part time teaching faculty in the Restorative Dentistry Department in 1991-1992 teaching undergraduates. From 1992-1997 he worked in the United Kingdom and New Zealand in private general practice. He attained his F.R.A.C.D.S (Fellow of the Royal

Australian College of Dental Surgeons) in 1998 and most recently his F.I.C.C.D.E (Fellow of the International College of Continuing Education). He is a graduate of the prestigious Las Vegas Institute for Advanced Dental Studies and continues to further his knowledge through continuing education both locally and abroad. He maintains a private general practice in Castle Hill, NSW with his partner Dr Alfred Calavassy which is centred around comprehensive aesthetic rehabilitation.

**Dr Douglas L. Lambert, DDS, FACD**



Dr Douglas Lambert received his DDS from University of Minnesota School of Dentistry in 1984. He is an active member of the Minnesota Dental Association and Minneapolis District Dental Society and was President of the latter from 2000-2001. He is a member of the board of directors of the International Academy for Sports Dentistry and was Continuing Education Co-Chair of the American Academy of Cosmetic Dentistry, North Central Region from 1995-99. He is a guest lecturer for the University of Minnesota, Department of Continuing Dental Education, a clinical researcher for various dental manufacturers and guest lecturer for universities, national, state, and local dental societies. He is also a member of the Minnesota State Disaster Identification Team. He has been published many times in professional dental journals and lectured extensively and conducted workshops on many aspects of dentistry. He maintains a private practice with an emphasis on aesthetics, sports and comprehensive dentistry in Edina, Minnesota.

**Dr Michael N. Mandikos, BDS, MS (New York), Cert Pros, FRACDS**



Dr Mandikos received his Bachelor of Dental Science Degree with honours, from the University of Queensland. From 1995 to 1998 he studied at the State University of New York at Buffalo, (USA) where he graduated with a Certificate in Prosthodontics and Masters Degree in Biomaterials. He has researched direct and indirect composite resins (Artglass, Belleglass, Targis) and he has published several papers in Australian and international journals on clinical and dental materials topics. Dr Mandikos has presented continuing education programs at dental meetings throughout Australia and South East Asia and he is a Fellow of the Royal Australasian College of Dental Surgeons and a recipient of the College Medal. He is a Visiting Specialist Prosthodontist at the University of Queensland Dental School and was the Visiting Prosthodontist to the Army's 7th CSSB Dental Company at Enoggera. He maintains a private practice limited to Prosthodontics in Brisbane City.



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