+++ *tele*gramm +++ 1/1998

▶ **editorial**

Dear Reader,

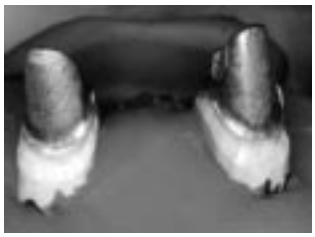
We are pleased being able to present you the first edition of our customers' magazine *tele*gramm in English language. The aim of the *tele*gramm is to offer a forum to all Gramm electroforming users enabling them to get news, interesting information and the exchange of experience with other users.
We hope you will enjoy reading the *tele*gramm

The *tele*gramm-Team

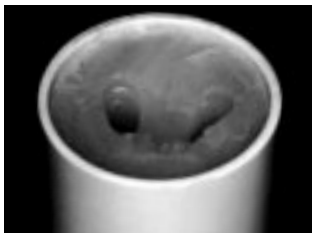
Small but cute! Electroforming with the GAMMAT® 11C

An uniformed person might call the Gramm GAMMAT® 11C a toy, but the reality is that this unit is one of the smallest and most efficient Galvano units of its type. Although the GHP (Gold Hard Plating) system is not included in its functions, the main feature, the patented sensor control, is exactly the same as in its big brother, the Gramm GAMMAT® 21M, as is the concept of economic use of the gold bath and solution. Only the dimensions of the unit have been diminish.
The maximum volume of solution has been reduced to 200 ml, giving a gold content of approximately 3g, which would be sufficient for about 4 - 6 units, depending on their size. As a full cycle takes a maximum of eight hours, careful work planning could allow for two cycles to carried out in a day, thus it would be possible to gold electroform eight to twelve units a day. For the average laboratory, this would be more than sufficient, because for them to purchase a larger system, such as the Gramm GAMMAT® 21M, would be totally uneconomic. Hence the development of the Gramm GAMMAT® 11C and the possibility of allowing the Gramm Gold Electroforming System to benefit all laboratories at an affordable price.

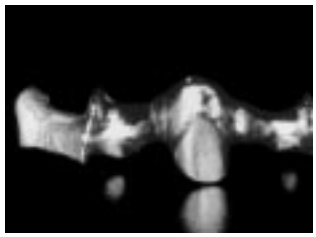
What is Electroforming?
Gold is provided in an ionic form and produces an electrolytic solution. The object to be replicated in gold, in this instance an abutment die, is coated in a metallic silver varnish and becomes the cathode. By passing an electric current through the electrolytic solution from the anode to the cathode, the gold ions are forced out of solution and are deposited onto the cathode. The electroforming of the object is totally influenced by the parameters of amperage, time and quantity of metal ions (gold) available in the bath. This is the conventional technique of all electroforming and is common to all electroforming systems. There are differences in actual control technology and in how the gold solutions are provided. It must be noted that, unlike standard 24 carat gold, whick is very soft and malleable, the molecular structure of electroformed gold, creates a hardness similar to a type III casting gold.
The system of gold electroforming crown substructures has been available now for a number of years, the technique is simple und easy to learn and may be mastered without undue problems. The basic production of a gold electroformed unit, up until the final fitting onto the



Picture 1
Mastermodel prepared for Duplication



Picture 2
Finished silicon form



Picture 3
Conventional cast pontic

Picture 4
Prepared die-stone-abutments trimmed into U-shape.

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master model, does not require any special dental skills. A dental technician is more than adequately trained to undertake the preliminary aspects of electroforming, therefore much of the work can safely be undertaken by less qualified staff, at a considerable cost saving to the laboratory.

Fields of application

With dental technicians becoming more experienced in the use of electroformed gold substructures, the applications of use in prosthetic dentistry has grown enormously. Generally, the main types of prosthesis being produced are individual crowns, both anterior and posterior, but because the strength of conventional bonded crowns is somewhat higher, care should taken in correct patient selection. The strength and position of the bite must always be taken into consideration and the most suitable material must be chosen for the particular case. There is yet to be a material or procedure developed, that is correct for all situations.

Other well established applications for electroformed prosthesis are inlays, onlays and three quarter crowns. Electroformed inlay shells filled with porcelain are an ideal alternative to a conventional filling, particularly because of the ease of cementation, and burnishability of the margin.

During the past few years, new and advanced techniques have been developed for the use of electroforming. Bridges may he constructed, secondary parts of telescopic crowns, surrounds of supra areas of implants and, in some instances, even primary parts are now possible to be formed by electroforming. The exposed areas of complete dentures can now be electroplated, which may be of considerable help to those patients who suffer extremes of allergic reaction to the metal denture base being used.

The only limits to the use of gold electroformed prosthesis are physical – what cannot be made conductive, cannot be electroformed or electroplated!

Biocompatibilty

The technique of electroforming has been possible for many years, but it has not been developed fully until now, when patients are demanding full biocompatibility of dental prosthesis. Being produced from 24 carat gold, with a purity of 99.9%, the electroformed crown is totally biocompatible. The patients benefits from this technique because the prosthesis will neither oxidise or corrode within the human body and the fit is excellent.

The biocompatability of the substructure of a dental prosthesis cannot be described more clearly, but everything has a price! Electroforming systems are not usually basic equipment of the average dental laboratory and to purchase such a system requires looking at how the costs can be converted into profit. What are the actual costs that occur when purchasing new technology

• First there is the capital expenditure on equipment,

• The technology has be ”sold” both to clinician and patient, that is marketing cost

• Training and learning of new techniques and understanding the new technology.

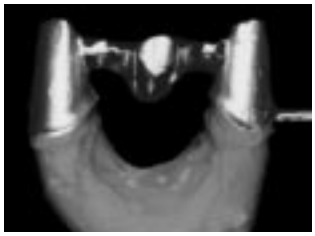
The benefits are that the new technology will provide ”image” building for your laboratory and that is a vital aspect of all business today. The provision of quality service and communication to your clients, will place you ahead of the low cost, cheap provider. Do not even think of trying to compete with products provided by low labour cost laboratories. Quality, service, knowledge and information available instantly and locally are the greatest weapons a dental laboratory have in the face of a devastating downward price spiral. Knowledgeable and intelligent dialogue with your clients is an important aspect of service and a innovative and elevated approach to solving problems will appreciated and well rewarded.

The Bridge

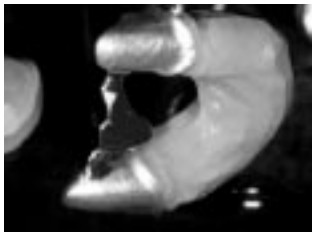
The production of an electroformed bridge is another approach to solving a specific problem. The technical procedures are described as follows:

• The basic preparation of models and dies are no different than for producing a conventional porcelain

Picture 5
Duplicate stone-die painted with silver lacquer

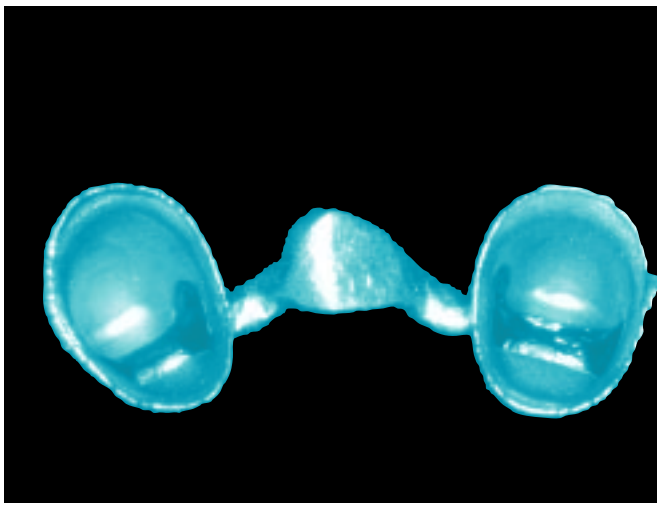


Picture 6
Bridge gadget put on wet varnish



Picture 7
Ready for electroforming: model in galvano head

Picture 8
GAMMAT® 11C



bonded to metal crown. No special model systems are required for electroforming techniques, use the model system of your choice.

• The die preparation is similar to that of a normal crown. Ditch the margin line as normal.

• The die is then sealed, undercuts block out and any sharp preparation edges for lines, rounded of with wax.

• The abutment dies, together with the pontic areas must be boxed, ready for the silicone duplicating material to be poured. It is important to first block out all the saw cuts with plastercine (picture 1). If possible, mix the silicone duplicating material under vacuum, to eliminate air bubbles. Hold high above the mould and pour in a long thin stream, this will also avoid forming of air bubbles. Leave for 30 minutes and remove the model from the mould (picture 2).

• After removing the model, leave the mould to "rest" for at least five minutes, so that it will regain its correct shape. Fill with a type IV die stone, which may then be removed after thirty minutes.

• Meanwhite, the bridge pontic and supporting arms are waxed up and invested in a fast heat investment and cast. This should take only about one and a half hours. The alloy should have coefficient of thermal expansion of 14.2. After casting, work off the bridge unit and polish to a high, smooth lustre. Clean in an ultrasonic bath and do not handle again with the figure (picture 3).

• The duplicated plaster model with abutments should be trimmed and reduced into an U-form (picture 4).

• At the base of the margin of the smallest die, drill a hole and fix the connecting copper wire with super glue. Ensure there is no excess of glue, then strip back 1mm of the insulation away from the plaster model.

• The areas of the dies that are to be gold electroformed, are carefully painted with silver conductive varnish, using a fine brush. Care must be taken to ensure the exposed copper wire is totally covered (picture 5).

• The prepared cast bridge unit is now positioned onto the dies, whilst the silver varnish is still wet (picture 6).

• The bridge unit itself, does not have to be painted, but ensure any spaces between the abutments and the bridge connectors are filled. The drying time should be about one hour.

• Using the solution chart in the instruction manual, the necessary amount of solution can be determined. If in doubt, be over generous in dispensing, as insufficient solution will result in a friable and dark coloured substructure.

• The amount of activator and cycle time, will also be determined by the solution chart. The calculated amount of solution is placed into a beaker, which is then fitted into the Gramm GAMMAT® 11C Unit. Also the requisite amount of activator is added. This is left to be brought to the correct working temperature, which takes approximately one and half hours.

• The prepared bridge, ready for electroforming, is fitted into the electroforming head of the Gramm GAMMAT® 11C unit and locked into the screw connector. The angle of the bridge should be at an angle of 45 degrees up from the bottom of the beaker and facing towards the flow of the electrolyte. Ensure that all parts, including the sensor, are covcred by solution (picture 7).

• Set the running time and start the electroforming process. The sensor fitted to the Gramm GAMMAT® 11C unit, measures, controls und regulates the parameters of current and ion deposition through out the electro-formling process. A visual check that electroforming is taking place should be made five to ten minutes after starting, by slightly lifting the beaker up. The process is automatically switched off after the designated time has elapsed (picture 8).

• On completion of electro-forming (picture 9), cut off the copper wire and place the gold electroformed bridge unit into an ultrasonic cleaner, using Gramm Special Plaster Remover. After the plaster is dissolved away, remove the silver conductive varnish with half concentrated saltpetre (note

Picture 9
electroformed GES-bridge finished

Picture 10
The finished and electroformed bridge being fit onto the master model

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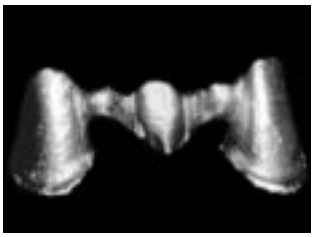
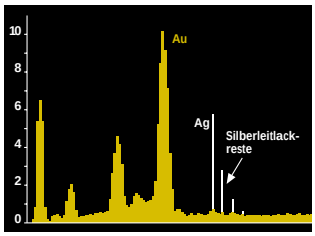
all safety regulations).
• The bridge unit is now fitted back down onto the master model, ready for gold bonding and application of the porcelain (picture 10).
• Previously, into the original silicon mould, a copy model, produced in a refractory material was produce. This has been degassed and prepared as per the instructions and is now used as a tailor made crown / bridge stand during ceramic firing. The bridge unit is now thoroughly steamed cleaned and the bonder is applied and air fired in a porcelain furnace. There is no special requirements for the porcelain build up, using any bonding porcelain of choice. This unconventional approach to production of a bridge, results in a well fitting, biocompatible, highly aesthetic fully covered ceramic bridge, based on delicate but strong gold copings and pontic!



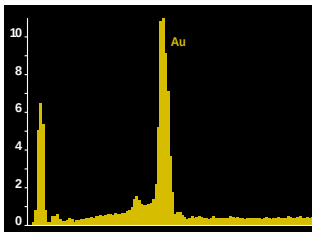
Text: Dave Pert
Photos: Ingrid Beuter-Luecke

Lacquer is off!

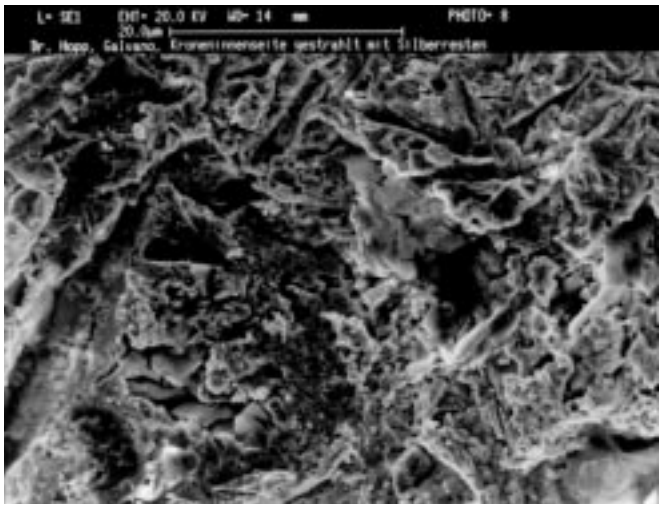
We have learned from our customers, that with some telescopic cases, there has been the occasional occurrence of discoloration. This, we have discovered,



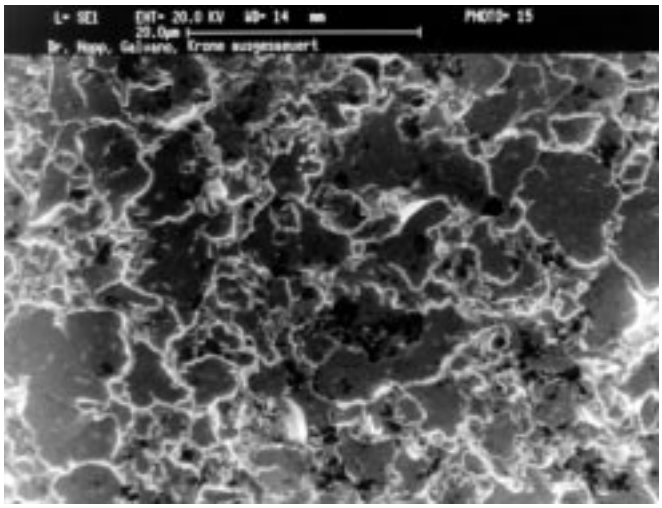
has been caused by incomplete removal of the silver lacquer. Through our own research and supported by Dr. M. Hopp, of Charité Berlin, it has also been found that the silver lacquer is not always completely blasted off copings, inlays etc., of it may actually be "pushed" into the galvanic gold structure, along with particles of the blasting media. Although this will not produce discoloration of the gold, it can possibly cause impurities during the porcelain firing cycle.
To eliminate this possibility, always ensure the blasting media is glass bead, never exceed 2 bar and never blast the surface directly at 90 degrees. If there is any doubt, pickle the units in a 20 - 25% dilution of nitric acid (HNO_3).
Should this method be used, exceptional care must be taken handling the acid.
To prevent yellow stained fingers, we recommend to fill the nitric acid into a plastic basin provided with screw cap. Add the galvano copings and screw tightly the basin. Now, the silver lacquer can be evenly



removed without any problems and without residue.
The adjacent pictures, taken by a scanning microscope, show clearly the difference. Where the electroformed substructure has been pickled in acid, there is no silver residue, but where poor blasting technique was used, silver may clearly be seen.



Electroformed crown, silver lacquer blasted



Electroformed crown, silver lacquer acidified

Modification of Working Procedure

For Gramm GES customers who purchased their systems prior to July, 1997, there have been some changes to working procedures and some exciting new products. It has been discovered that

the Gramm GAMMAT® 21M will produce electroformed gold of iriproved grain structure, by adiusting the amount of water used as a jacket in the outer beaker. After a series of Laboratory Trials and practical tests, this new technique has now been included as a standard feature of Operation. In the past, a constant volume of water has been placed in the 800ml beaker into which, the small beaker with the required amount of ECOLYT solution, is placed. It was found that by varying the amount of water in relation to the amount of ECOLYT solution, an improved metal structure could be obtained. 150ml ECOLYT will require 250ml water, this increases by increments of 25ml, to a maximum of 325ml of water to 300ml of gold solution. If this sounds complexed, please contact us for your copy of the latest gold solution/operating hours schedule.

One major advantage of Gramm GES electroformed substructures, is their minimum wall thickness. However, during the firing phases of the porcelain build up, often at temperatures above 900° C, this thin, unsupported, 24 carat, gold shell could possible warp and distort.
To help over come this possibility, a special refractory material (order no. 910.00.061) from which

individual tailor made crown stands are produced, was formulated and developed. Although this material has been available in some markets for some time, it has been found, from practical experience gained in field use and from our own laboratory tests, that the original instructions need slight modification. The mixing ratio must now be 30g pdr : 10ml liq, this will ensure a balanced coefficient of Expansion to that of the Gramm GES Electroformed gold.

By continous research and development, we are always striving to be able to improve the quality of the products we supply. All improvements are designed to produce a better and more accurate electroformed product.
The fitting surface quality depends entirely on the smoothness of the silver conductive layer (order no 910.00.049). Although the product you are using may look the same as you have been using, the formulation has been changed. You should find it easier to apply and it will not thicken or become lumpy as readily. Remember, when using the thinners, do not over thin and do not use the thinners as a means of making more conductive material. Over thinning will be detrimental to the electroforming results!

For those of you with the Au Hard Gold Plating System, we have developed a new and improved cleaner and fat dissolving cleaner (order no 910.00.031). The first stage of the GHP process, is using the fat dissolving cleaner, always in an ultrasonic bath. Together with the new cleaning solution, considerable improvements in results may be achieved. Actual working time, depending on contamination, is about 3 - 5 minutes. The cleaning solution is not only for preparing items for gold plating, but may be used as a quality, general purpose, ultrasonic cleaning solution.

▶ **the quotation**
„from the point of view of dental medicine, electroformed inlays are really top; they have such an excellent marginal accuracy that we would only usually had dreams of."
Dr. Dr. Karl Heinz Löchte
President of the
German Medical Council of Dentists

Gold Bonder

The Gramm gold bonder has be specially developed for the gold electroforming in conjunction with either high or low fusing procelains. 24 carat gold – exclusively used in the electroforming process – does not create any oxide layer. Instead of using the conventional oxide firing cycle, a bonding agent (Gramm Gold Bonder) is applied. This gold bonder, comprising of pure gold and ceramic particles, is applied to all surfaces that are to receive porcelain and is similar to use paste opaque, the firing temperature being 950°C. This high temperature will allow the gold bonder to melt and diffuse into the galvanic structure. The ceramic particles, deposited in the upper third of the bonding layer, will create a reliable bond with the ceramic material that will be applied afterwards. The result is a perfect bond between the galvano gold and applied porcelain.
Order number: 910.00.021

One for Two

A great new product! One wax for two uses! The new Galvano Wax has been produced to replace the existing Block Out Wax and may be considered as an universal wax for galvano techniques. To visually differentiate between the two, the new Galvano Wax is pink, instead of brown. So what is so special! It is still for use as a conventional block out wax, but it is harder and has much a higher melting point. This allows it to be used for the production of a completely new type of Gold Electroformed Substructures – Splinted Copings. instead of spending time and labour on a casting process, it is now possible to electroform wax. Please note, this technique **cannot** be use to manufacture bridges. For further information on Galvano Wax and the instruction for use, please contact your usual dealer.

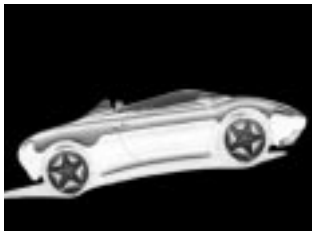
Trouble Shooting

There are occasions when small problems occur and you do not consider them important enough to discuss them with your dealer or ourselves. However, always tell us of your experiences, good or bad, because without this information, we are unable to build up an overall picture of what is actually happening in the field.
An occasional problem that can be experienced with a Gramm GAMMAT® 11C unit, is a good example. We slowly heard of several reports of the main fuse continually blowing. Our

service engineers thoroughly checked over the units, but no fault could be found, the dreaded "intermittent fault!". However, on checking the clients working procedure, it was discovered that the instructions were not being followed correctly. The units had been switched for the heat up cycle, but not turned off prior to plugging in the galvano head for the electroforming cycle. This action may cause that the internal, self setting fuse to "blow". Should this happen, disconnect the power pack (transformer) from the unit and the power pack from the main electricity supply. Leave for fifteen minutes and reconnect and start again (remember, the solution will have cooled down, so re-heat again, for at least thirty minutes). So, remember, never plug in the galvano head whilst the unit is still "ON".
On another occasion, we received a call, complaining that the copings were persistently too thin i.e. insufficient gold being taken from solution. Our German Technical Trainer, Rainer Schwarz, visited the client and on checking the equipment, was not surprised at the results being obtained. Both the sensor and the anode on the galvano head, had been beautifully gold plated. After soaking the offending head in Gramm Electrode Cleaner (order no. 003.01.300), for ten or fifteen minutes, the usual high standard of gold electroforming was resumed.

Gramm – About Ourselves

Without exception, anyone reading this article will think of Gramm purely as a manufacturer of dental electroforming equipment and matetrials and that our backround is dental; nothing could be further from the truth. The Gramm GAMMAT® 11C & 21M electroforming units are



based on, and are an extension of, an industrial system known as Gramm Selective Technology. This is a technique, developed in the early eighties, for the electroplating of appliances in heavy industry, thus allowing for the production of galvanic surfaces in a automated manufacturing system, with minimal emission.

Gramm are still very much involved producing products based on this principle – e.g. for hard anodising or iron coating car pistons made from aluminium, such as for engines of the new V6 and V8 Mercedes Benz. Other than gold, aluminium is the most important material that Gramm is involved with.

Gramm are not only manufactures of products, but also leaders in the field of galvanic surface treatments, which has always been a mainstay of the Company's fortune. Because we have become specialist in fast coating processes of light weight materials, such as aluminium, it has lead to further orders from highly reputable clients. Gramm Technik have been closely associated with the worlds largest electro nuclear particle accerator, based at the research centre near Geneva (CERN). The 27 kilometre acceleration circular tube was required to be given a very special galvanic coating, using a technique developed by the Company.

Another highlight in the Company's achievements, was winning the contract for supplying components for the new ICE high speed train, for the German Railway Company. The whole fleet is equipped with aluminium paneels, coated galvanically with chrome. This, again, is a technique pioneered by Gramm Technik and is known as GALVANAL®. This is a treatment that requires the highest degree of precision and accuracy, the surface of the panels having to be

totally smooth and even over their entire 2.5 metre length. The quality of the pre production prototypes was decisive factor in obtaining the final production order. The next generation of ICE – ICE 2.2 & ICT – which will come into service from the summer of 1998, will again, be equipped with special GALVANAL®, genuine chrome / aluminium panels.

View looking into the front lounge of the new ICE 2.2 high-speed train, of the German Railway Company.

There was something going on…

Chicago Midwinter Meeting
There must be a better place to be than Chicago in the depth of winter, but if its February, it must be "Chicago Midwinter". This world renown showpiece, kicks off the annual rounds of dental meetings. This years attendance figures were in excess of 40,000, many, of course, from "over the pond", Europe. All gathered to meet old acquaintance, make

new ones and to discover "What's new" in the business.
On the Gramm stand, Mr. Andreas Hoffmann, Master Dental Technician, from Mohringen, Germany, demonstrated the ease with which electroformed technology can be used in dentistry. Mr. Hoffmann also demonstrated the use of the AlphaLaser and its application in extending the use and capabilities of gold electroforming.

Maulbronn Symposium
During March in the venerable vaults of the Maulbronn Monastery, near Pforzheim in Germany, which UNESCO considers to be one of the cultural heritage's of the world, the „First Maulbronn Material Symposium" was held. After the speech of welcome by the organiser, Christion Frank (Master Dental Technician and owner of DSI Laser Service) Dr. Michael Hopp (Head of the Research Department of the University of Berlin (Charité) initiated a series of lectures, beginning with the first main topic, "Titanium". Followed by the subject "Lasers & Electroforming - the most biocompatible combination since the existance of dentures", presented by Mr. Andreas Hoffmann, Master Dental Technician and Klaus Rassinger, Managing Director of Gramm Technik. Even the visitors from Japan were excited over this excellent presentation, organised by DSI Laser Service and Mr. Christian Frank and it is hoped to make this an annual symposium.

Basel Material Symposium
Every two year, the Who's Who in dentistry, assemble in December to attend the Basel Material Symposium, organised by Prof. Dr. J. Wirz (Head of Department of Dental Technology, Dentistry and Dental Materials of the University of Basel). There were many quality lectures, particularly emphasising the subject of new materials and bio-compatibility. Not surprisingly, the organiser, Prof. Wirz, presented the subject "Electroforming". With his usual great enthusiasm, he discussed the subject in depth, producing considerable amount of information and details of long term,

clinical studies. It is now very understandable that, besides Titanium, Gold proves to be the most compatible, restorative material available.
The subject of electroforming was not only limited to this particular lecture. There was hardly any round of discussion, during the whole meeting, when electro-forming was not debated and considered to be a major contender for the most suitable all round restorative material. Plastics, composites and various laminates were closely examined, but all had areas of doubt cast upon them.

Asian Experiences
During the past year, Japan, Taiwan, The Philippines and Australia have been centres for ongoing Gramm Gold Electroforming Training Courses. These courses, entitled "The Ease of Electro-

forming", were presented by Mrs. Ingrid Beuter-Luecke (Dental Technician) and Klaus Rassinger (Managing Director, Gramm Technik). In follow up courses, more complex techniques were demonstrated, including the production of electroformed bridges.
Thanks to the active support of the local agents, Tei-Jel from Taiwan, Kawai and Yamahachi from Japan, as well as Livingstone and Herda & Greenaway from Australia, these courses were a great success.

impressum
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Associated Editor / Publisher
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Thanks to Dave Pert

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