

tree pathology news

NEWSLETTER OF THE TREE PATHOLOGY
COOPERATIVE PROGRAMME - UFS

NO 16

NOVEMBER 1997



HAPPY CHRISTMAS, HAPPY
1998

The team of the TPCP wish you all a most joyous Christmas and all good wishes for the coming year. We must again thank our many friends and colleagues in plantations, at the nurseries, at research centres and regional and head offices for the tremendous support that we have enjoyed during the course of the past year. The TPCP is the epitome of a collaborative venture. We owe our success to a large number of people who provide us with trees, trials, accommodation, financial and many other forms of support. Thank you one and all. We all enjoy working with you and look forward to many happy times and challenges during 1998.



DIRECTOR'S MESSAGE

We once again approach the end of a year and marvel at how rapidly time has past. It is said that the passage of time is perceived relative to the number of years that we have lived. As the oldest member of the team of the TPCP, my reflecting on the rapidly passing years might be rather out of line with the impressions of our younger members. On the other hand, those younger members of the team

are, in most cases, students with limited time available to complete projects. I am sure that these rather rigid time frames also leads to a perception that time is passing inordinately fast.

The TPCP has enjoyed another eventful and interesting year. Team members have spent a great number of days in plantations. During the course of the coming two months, I will be reviewing these dates for our Annual Report. I am already curious to know whether we will

have exceeded our four hundred and seventy something person days in the field during 1996. We have also had representation at the IUFRO *Eucalyptus* Meeting in Salvador (Brazil), the Annual Meeting of the American Phytopathological Society, the Mycological Society of America, the IUFRO Root and Butt Rot meeting in Carcans (France), the IUFRO Symposium on the Physiology and Genetics of Tree Phytophage Interactions

at Arcachon (France), the biennial meeting of the Australasian Phytopathology Society and the golden jubilee of the Indian Phytopathology Society in New Delhi. It is safe to say that the TPCP is well recognised both national and internationally and the involvement of its members is continuously promoted.

THE TPCP MOVES TO PRETORIA

For those of you that do not know this, the TPCP has been formally based at the University of the Orange Free State for almost eight years. For two years prior to its formal commencement in January 1990, the programme was in a fledgling stage but was already functioning. We have thus enjoyed almost ten years in the Free State. These have been ten remarkably productive years and in this time the TPCP has grown from strength to strength. Many successes have been notched up on the "accomplishments pole", many new diseases recognised and studied, new technologies introduced, students graduated, awards received and more. Perhaps the greatest accomplishment has been to show conclusively that the TPCP could function from a University base and that this could be in the centre of the Free State - not a centre previously known for its links to Forestry.

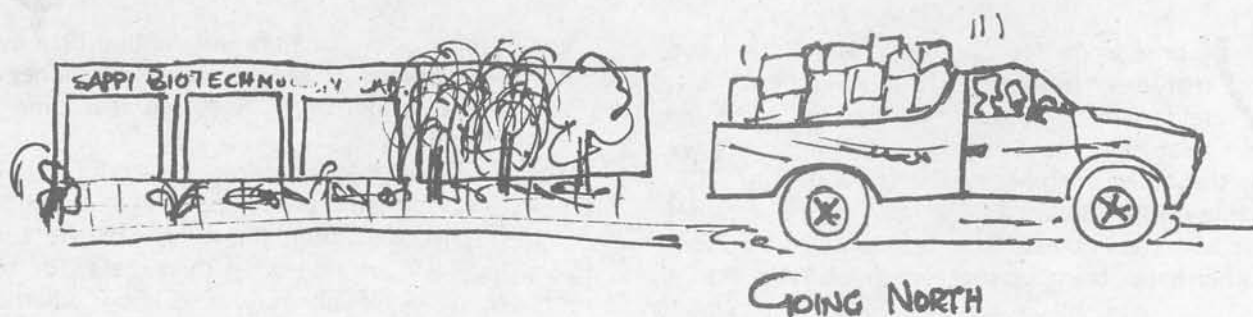
Most readers of our Tree Pathology News will already know that the TPCP will move to Pretoria in 1998. The decision to move the Programme has not been taken lightly and was made after consultation with all the members and a large number of other interested parties.

The TPCP is now set to become the founding Programme of the new FABI (Forestry and Agricultural Biotechnology Institute) which is being established on the campus of the University of Pretoria. The new FABI building which will cost about R9million is gradually rising from the dust in Lunnon Road across from the main building of the Faculty of Biological Sciences and Agriculture. This will be a wonderful facility, somewhat similar to that in which we are currently housed but with

facilities focused directly on our major objective of "KEEPING TREES HEALTHY"

In many ways, the team will move with "sore hearts". We owe much of our success to a group of wonderful colleagues at KOVSIES and to tremendous commitment by the University that provided us with our first home. A large number of people are linked to this move and we will all leave special friends and family. Of course we are all excited at the new challenges that await us, we also do not wish to detract from the fact that we have had a tremendously positive relationship in Bloemfontein.

The time frame for our move is difficult to define accurately. The first group to move will be those attached to the Forest Molecular Biotechnology Co-operative (FMBC) Programme and the "new technologies" programme of the TPCP. This group will begin to move in December and their facilities, on the sixth floor of the Biological and Agricultural Sciences building, are almost in place as I write this note. I expect that there will be a "trickle" of new arrivals in Pretoria during the first few months of 1998 and the final move - which will include the Disease Clinic and associated functions will most likely occur in the second quarter. This will all depend on progress with the completion of the new FABI building. We will be sharing progress with you continuously - and if you wish to "watch FABI grow" you will be able to do so via our new FABI web site (<http://www.up.ac.za/academic/fabi>).





THE TPCP ANNUAL MEETING

As has become our tradition, we will hold the annual meeting of the TPCP during the second week of March. This meeting will be held on Tuesday 10th and Wednesday 11th March and will be the first to occur on the campus of the University of Pretoria. We are hoping that Prof. Johan van Zyl, principal of UP, will open the meeting and Mike Edwards, Executive Director of the Forest Owners Association will present the keynote lecture. Please consult with your member of the TPCP Board if you would like to attend our annual meeting which has become a notable feature on the calendar of South African Forestry. If we can assist you in arranging for this meeting, do not hesitate to contact us.

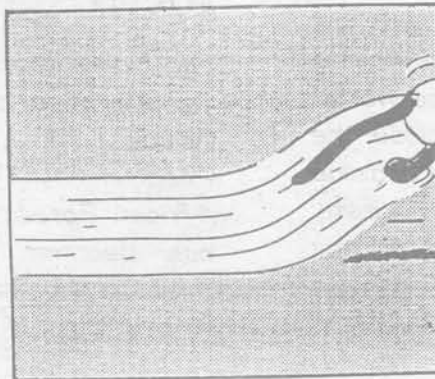
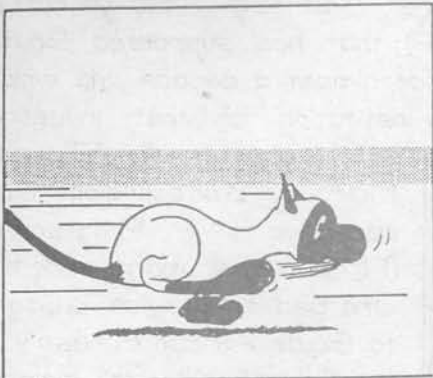
?????? HAVE YOU HEARD ???????

Phytophthora cinnamomi was introduced into Western Australia and continues to kill millions of plants over huge tracts in that area.

?????? HAVE YOU HEARD ???????

That the first outbreak of bacterial wilt of *Eucalyptus* occurred in south Africa this year
(See page 7)

SERENA





FABI

FORESTRY AND AGRICULTURAL BIOTECHNOLOGY INSTITUTE

“FUTURE FORESTS FOOD”

The establishment of FABI (Forestry and Agricultural Biotechnology Institute) at the University of Pretoria is based on a recognition that the future of Forestry and Agriculture in South Africa will depend strongly on the incorporation of new technologies into these industries. Opportunities for Forestry and Agriculture that have emerged in recent times from the application of various biotechnologies are immense, and almost beyond imagination. Currently, forestry and food crops containing novel genes are already being deployed worldwide. Well recognised examples include the incorporation of genes conferring herbicide resistance and resistance to insect pests. Other products are also appearing on the scene increasingly rapidly and this trend will not slow down in coming years.

Remaining competitive with

?????? HAVE YOU HEARD ????????

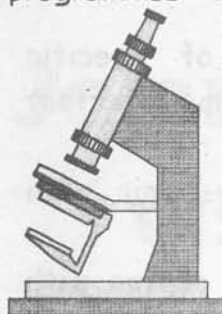
Len van Zyl (Mr *Coniothyrium*) was mugged on the CopaCabana and refused to eat Guinea Pig in Bolivia!
(See also page 8).

products that are internationally attractive will, in all likelihood become progressively more important to South African Forestry and Agriculture in the future. FABI is striving to assist this sector of the local economy to meet these goals. This is achieved through goal directed research undertaken in a partnership with major players in these markets. Being based at a University affords FABI the capacity to build future human resources in biotechnology which will be crucial to the future of Forestry and Agriculture in South Africa. A base at the University of Pretoria enables FABI to enjoy collaboration and linkage with the majority of statutory bodies undertaking research in the plant and animal sciences. Added value comes from training grants, participation of students in research programmes and an enormous human and technological resource associated with the largest University in South Africa.

TRACK RECORD

FABI was established on the foundation of two highly successful and internationally acclaimed Co-operative programmes in Forestry. These include the Tree Pathology Co-operative Programme (TPCP) that has supported South African Forestry for almost a decade and which has become an Institution of that industry. Likewise, the Forest Molecular Biotechnology Co-operative Programme (FMBC) has, more recently emerged to provide support to South African Forestry in the field of molecular biology. Staff of the University of

Pretoria linked to FABI have also had long term associations with the Citrus and Subtropical Fruit industries as well as other programmes linked to Agricultural crops.



SOME BIOTECHNOLOGICAL FIELDS OF CONCERN TO FABI

- Genetic fingerprinting of cultivars and clones of commercial value
- Improved and efficient techniques for the propagation of fibre and food plants
- Discovery of novel genes of value to Agriculture and Forestry
- Harnessing of microbes for the bioremediation of Forestry and Agricultural waste products
- Deployment of new and valuable genes in crop and fibre plants
- Development of rapid techniques for the recognition of desirable traits in trees and other crop plants
- Production through selection and genetic engineering, of microbes with improved capacity to be used in the biological control of insects and pathogens

PRIMARY OBJECTIVES OF FABI

- To promote the broad field of plant biotechnology through an interdisciplinary approach and with close linkage to a wide range of academic departments
- To undertake research of the highest possible calibre while at the same time provide short and longer term benefits to the Forestry and Agricultural sectors of South Africa
- To establish partnerships with Industries linked to Agriculture and Forestry, both nationally and internationally, to produce new and improved products and thus to promote competitiveness in trading
- To promote the education of South Africans, in the fields of Forestry and Agriculture
- To promote the future development of FABI and the University of Pretoria

FUNGICIDES AND RESISTANCE

Just as human pathogens become resistant to antibiotics after continuous and widespread use so have several plant pathogens developed strains resistant to certain fungicides. For many years protectant fungicides such as Thiram or Captan were used and no resistant strains were observed. This is presumably

because these fungicides affect several vital processes of the pathogen and too many gene changes would be necessary to produce a resistant strain. The introduction of systemic fungicides, especially Benomyl (Benlate), triggered the appearance of strains of numerous fungi resistant to one or more fungicides. In some cases, strains resistant to Benomyl appeared and became widespread after only two years of use of the chemical. The reason for the development of resistant strains after continuous application of systemic fungicides is apparently due to the fact that they are specific in their action. This means that they affect only one or perhaps two steps in a genetically controlled event in the metabolism of the fungus and, as a result, a resistant population can arise quickly either by a single mutation or by selection of resistant individuals in a population. Good systemic fungicides have thus become ineffective. But the resistant

strains can still be controlled to a practical level through changes in the methods of fungicide deployment. This can be achieved by

- either using mixtures of specific systemic and wide-spectrum protectant fungicides;
- alternating sprays of systemic with protectant fungicides, or
- spraying during half the season with systemic and the other half with protectant fungicides.

In each of the above schedules, the systemic fungicide controls the disease, while the protectant chemical eliminates any strains that may develop resistance to the systemic fungicide.

Adapted from Agrios GN (1988) *Plant Pathology* 3rd Edition. Academic Press, San Diego.



INVITATION

We would like to invite you to address your comments about the TPCP or other related matters of concern, by sending correspondence to the Editor. Your letter may be printed in further editions of Tree Pathology News.



Bacterial wilt : first report on eucalypts in South Africa

Ralsonia solanacearum, the causal agent of bacterial wilt, has one of the widest host ranges of all plant pathogenic bacteria. Over 50 plant families contain susceptible species. *R. solanacearum* was first reported on eucalypts in the late 1980s in Brazil. Since then, there have been reports of its occurrence on this host in Australia and China. Earlier this year, an eighteen-month old clonally propagated *E. grandis/E. camadulensis*

hybrid in Zululand, KwaZulu/Natal, showed signs of wilting. The vascular tissue of infected plants was discoloured and bacterial ooze was produced from cut surfaces. *R. solanacearum* was isolated and identified from this material. Pathogenicity tests were conducted and young seedlings wilted within three days of inoculation. Recent visits to the site, where the outbreak occurred, showed no further spread of the disease. However, infection by the bacterium is favoured by warm conditions. The site will thus be closely monitored during the next few months.

IUFRO Conference on Silviculture and Improvement of Eucalypts

Dr Teresa Coutinho's account of her visit to Brazil

The opportunity to attend the IUFRO conference in Brazil came at a time when I had completed an article on Eucalyptus rust. I dearly wanted to see the disease for myself and as the centre of origin of this rust was in Brazil, I leapt at the chance. Once I arrived in Bahia, I realised that the disease occurs further south and is more prevalent in spring/summer. I, therefore, had to accept that my chances of seeing the disease were almost nil. This did not deter my determination and on the field trip to eucalypt plantations I carefully inspected all the new growth. Despite my

efforts, I did not see the disease and should the opportunity arise again, I will plan a visit to infected sites. Prof. Acelino Alfenas, who has worked extensively on Eucalyptus rust, attended the IUFRO conference and I had an opportunity to meet him and listened to his presentations on the topic. We also spent time discussing this disease and others occurring in Brazil.

Both Len and I learnt much about eucalypt cultivation and the highlight of the conference was a talk by Prof. Ron Sederoff on "The implications of genomic sciences for forest genetics". In general, the presentations were interesting but we found choosing which parallel session to attend frustrating. I suppose at large international



conferences, parallel sessions are a must, but perhaps the topics chosen should be more carefully selected. Language was also a problem. In the main hall all presentations were translated (which made giving them nerve racking as one had to speak clearly and slowly - an impossible task for some) while all parallel sessions were in the language of choice of the presenter. One never quite knew if one was going to understand the paper or not. Another enjoyable aspect of the conference was getting to know our colleagues in

the South African forestry industry. It was GREAT to be included as part of the team.

For those of you who attended the conference and are interested in knowing whether Len is still alive, I have some good news for you. Last time I heard he had left Peru and was eating guinea pigs in Bolivia.....

Guinea Pigs are considered good food in South America and their method of dressing a guinea pig for the table is much like that used for a sucking pig. The rodent is scalded in hot water, the hair removed, and the skin scraped with a knife. The animal is then cleaned and roasted.



The other great trek northwards!!

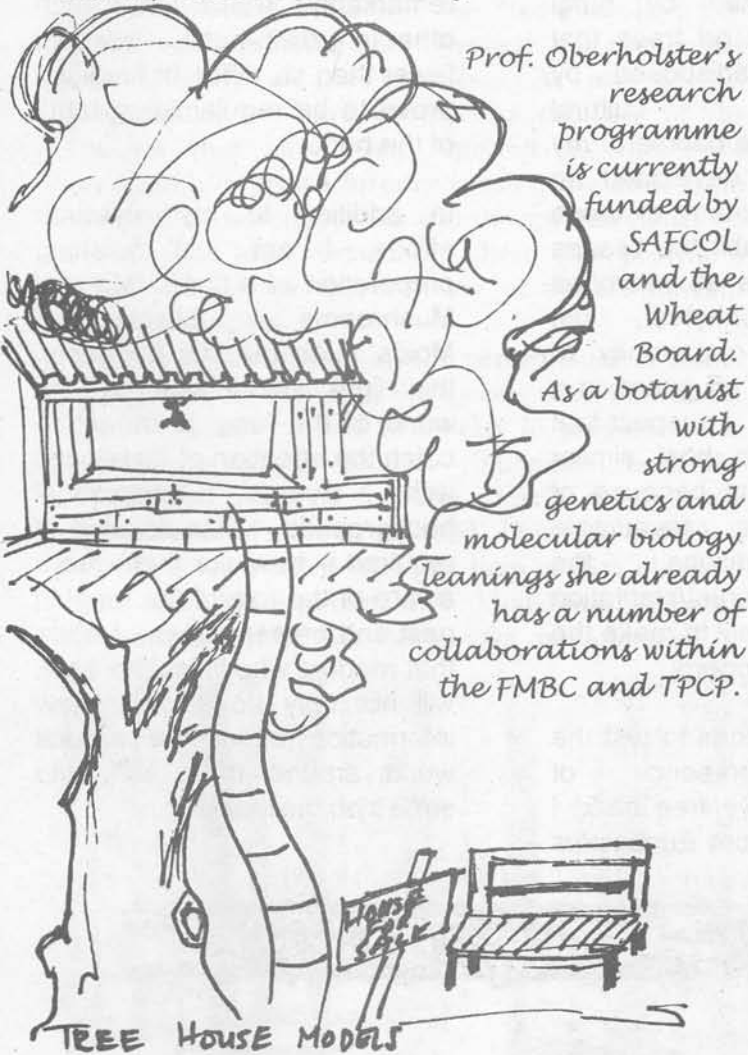
The Forest Molecular Biotechnology Co-operative Programme (FMBC) moves to Pretoria

Prof. Brenda Wingfield reporting

The FMBC and TPCP are moving!!!! After long negotiations with key players in the Forestry Industry the FMBC and TPCP will move to the University of Pretoria. This very exciting development is the result of discussions that started earlier this year with the Rector of the University of Pretoria,

Prof. Johan van Zyl. Prof. van Zyl's vision of the future of Forestry and Agricultural Biotechnology includes investing in the order of R15 million in buildings and renovations to house the FMBC, TPCP and a number of other programmes currently funded by the SA Forestry Industry.

The first step in the process of moving the FMBC programme was taken on the 17th of October. Prof. Brenda Wingfield and Prof. Anna-marie Oberholster accompanied by 26 students and one post doctoral fellow (three combis and one car!) met with the Department of Genetics at the University of Pretoria. This day started very early on the Friday morning for the Bloemfontein group (03:30) and the combis returned to Bloemfontein the same day.



Prof. Oberholster's research programme is currently funded by SAFCOL and the Wheat Board. As a botanist with strong genetics and molecular biology leanings she already has a number of collaborations within the FMBC and TPCP.

Her more formal addition to the overall group is just one of the very exciting aspects of the "MOVE".

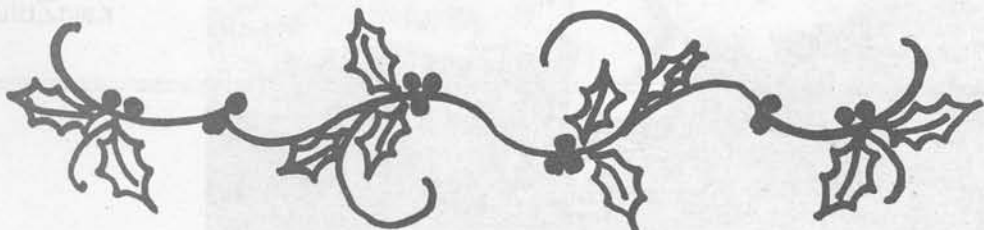
The Research groups of Profs. Oberholster and Wingfield will occupy the north wing of the sixth floor of the "old" Landbou

building on the University of Pretoria campus. This wing is being completely renovated. It is due to be completed by the end of the year when both research groups expect to occupy these premises. This facility has been designed as a "state of the art" Plant Molecular Biotechnology facility.

The mini symposium held on the 17th of October was initiated as kind of "show and tell" for both groups. The post graduate students from Bloemfontein and Pretoria each presented short summaries of their research interests. The lecturing staff also got an opportunity to highlight some of their respective activities. Profs. Wingfield and Oberholster will formally be part of the Department of Genetics at the University of Pretoria. Prof. Henk Huismans is the head of Genetics, the lecturing staff in his department include, Profs. Annabel Fossey, Carl Roux, Heime Liebenberg, Drs. Nombasa Tsengwa, Vida van Staden and soon to be "Dr." Wilma Fick.

After the presentations a braai was held on the Experimental farm of the University of Pretoria. Here, in between eating the spread put on by the Department of genetics (lots of wine and beer) everyone had an opportunity to get to know each other. The Department of Genetics also challenged the Bloemfonteiners on the volley ball court.

The meeting was enjoyed and I think appreciated on all sides. The commitment and interest in this gathering by the Pretoria top structure was very evident. The Dean of Biological and Agricultural Sciences, Prof. Robin Crewe, said a few words of welcome at the official symposium. He then joined the whole group for lunch. The Rector of the University, Prof. van Zyl, joined the group for a few minutes at the end of the presentations and effectively "had the last word".



PROF. GEORGE HUDLER VISITS TPCP

From July 1997 – January 1998, I am on sabbatical leave from Cornell University in New York State to catch up on overdue writing chores from home and to share experiences with students and staff in the Department of Microbiology and Biochemistry at UOFS. Mike and Brenda Wingfield have been most generous and gracious hosts.

Although I was trained as a forest pathologist, much of my activities now are directed towards developing pest management plans for trees and shrubs on home grounds,

city streets, parklands, and golf courses. From a financial standpoint, the "Green Industry" in New York is the largest of all agricultural endeavors, and single tree forestry is a large part of that. Many of the tree diseases I encounter in my work are caused by fungi causing cankers on trees that have been predisposed by unfavourable cultural conditions. In the course of my studies, I have developed an hypothesis that many of those "pathogens" inhabit the tissues of healthy plants as microbes we call "endophytes", just waiting for an opportunity to catch their hosts off guard; in a weakened state. I suspect that forest trees also host similar microbes but that because of generally more favourable growing conditions, the endophytes on forest/plantation trees are less likely to make the transition to pathogens.

As part of my efforts to test the hypothetical presence of endophytes in live tree bark, I have sampled from *Eucalyptus*

trees in plantations in several sites in KwaZulu/Natal and have begun to assay those samples. Even though I am early in the process, a surprisingly large number of samples have yielded fungal cultures, and those cultures are remarkably similar to each other in growth habit. I suspect fewer than six different fungi will prove to be regular inhabitants of the bark.

In addition to my research efforts, I am just finishing preparation of a book, "Magical Mushrooms, Mischievous Molds". As the title suggests, this light introduction to the world of the fungi is meant to catch the attention of audiences with diverse educational backgrounds – little science is required – to make them more aware of the role of the fungi in past and present times. I hope that readers who finish the book will not only do so with new information about the natural world around them but with smiles on their faces.



Prof George Hudler
collecting tree bark
samples in
KwaZulu/Natal

DISEASE MONITORING

An important activity of the Tree Pathology Co-operative Programme's is to monitor the occurrence and intensity of tree diseases. As part of our programme, we have compiled a database of the diseases that have been reported on the three commercially grown forestry species, the areas from which they were reported, and the species/clones on which they have occurred. These data provide a valuable basis for the selection of disease tolerant planting material.

Lack of information on the performance of clones and species in the field, on specific sites and under specific conditions lead to a delay in progress made toward combating diseases. Therefore, both the TPCP and research foresters closely monitor the performance of trees in the field. This will, in future, also be accomplished with the help of data obtained from the Mensuration and Modelling Research Consortium (MMRC). All disease data obtained by

forestry companies, as part of the MMRC programme will be incorporated into a communal database. Every forester/farmer can, however, also help by noting the performance of species and clones on specific sites etc. Future plantings can then be adjusted so as to plant species/clones best suited to specific sites. In this regard it is extremely important to share information with others, specifically the nursery providing the trees, the TPCP, ICFR or any research forester.

Most of the information in the TPCP data base has been compiled from samples sent to the TPCP diagnostic clinic, as well as from visits to plantations by the various members of the group. We, however, still require the support of every person in the plantation, since we can only physically reach a limited area of plantation each year.

For the accurate monitoring of diseases it is important to correctly identify the disease affecting the trees. To aid foresters and farmers in this regard, the TPCP is in the process of producing a pamphlet on the identification of tree diseases. This pamphlet will provide information on distinguishing between microbial (fungal/bacterial) diseases and disease-like symptoms caused by factors such as pollution, chemical burn etc. This pamphlet is intended to be used in conjunction with the other pamphlets that deal specifically with individual diseases. Together we can keep ahead of diseases!!



"Hello Chrissie.
You'll never guess
where I am now!!" -
Prof Mike Wingfield
staying in touch with
his office.

?????? HAVE YOU HEARD ???????

That two posters presented by TPCP team members were stolen at the IUFRO *Eucalyptus* meetings in
Salvador

(See full story on page 17)

The Ninth International Root and Butt Rot Conference was held during September in France. This conference forms part of the working party of the International Union of Forest Research Organisations (IUFRO) and is held every four years. The conference deals essentially with two rot fungi, *Armillaria* and *Heterobasidion*.

The venue was a town in the South of France, close to Bordeaux, called Carcan. This venue was chosen, not only because of the beauty of Southern France, but because this gave the 98 delegates from all over the world an opportunity to see Root and Butt rots in both forests and vineyards. It was also necessary to visit one of the chateaux, Château Caravan, to experience some of France's best red and white wines.

During the course of the conference forty-nine papers and fifty-five posters were presented. The papers dealt mainly with the taxonomy, genetics, population dynamics, etiology, epidemiology, pathogenicity, resistance and disease modelling of both *Armillaria* and *Heterobasidion*. It was evident, from the presented papers and posters that we are on the cutting edge of research in South Africa. This accounts not only for studies on *Armillaria*, but for research on tree pathogens in general.

Two field trips were held which were particularly interesting from both a pathological and mycological view point. The famous fungus, *Heterobasidion annosum* (a bracket fungus) is regularly reported in

literature but is not present in South Africa. It was thus my first experience in seeing this fungus in real life in the forest of Landes de Gascogne. Other fruiting bodies seen were those of *Collybia fusipes*. This pathogen exclusively attacks oak trees with *Quercus robur* (English white oak) being the most susceptible to this fungus.

The conference was very important from an academic stand point. Many papers dealt with problems associated with research on *Armillaria*. Problems such as those experienced with pathogenicity tests were discussed and this gave me insight into the difficulty associated with conducting such experiments. Attending this conference was also important as it gave me the opportunity to meet some of the leading international researchers on *Armillaria* and to establish contact with them.

THE TPCP AT THE NINTH INTERNATIONAL ROOT AND BUTT ROT CONFERENCE IN FRANCE

by Martin Coetzee

ABSTRACTS OF RECENT CONGRESS PAPERS

Identification of the causal agent of *Armillaria* root rot in South African forest plantations

Armillaria root rot has been known to occur on economical important *Pinus* and *Eucalyptus* spp. grown in plantations in South Africa, since the early 1900's. *Armillaria* spp. have been well studied in North America and Europe, but have received minimal attention in South Africa. Most reports of *Armillaria* root rot in South Africa have suggested that *A. mellea* (Vahl.:Fr.) P. Kumm. is the causal agent. The name *A. heimii* Pegler

has also been used in more recent reports, although these have not been based on mycological studies. The taxonomic disposition of *Armillaria* in South Africa, therefore, remains unknown. The aim of this study was to identify and characterise *Armillaria* isolates from forest plantations in South Africa. Isolates were collected from infected trees in different forestry regions of South Africa using established isolation techniques. The intergenic spacer region (IGS) between the large subunit (LSU) and 5S gene of the ribosomal DNA (rDNA) operon was amplified for all isolates using the primers P-1 and 5S-2B. The polymerase chain reaction (PCR) products were digested with the restriction endonuclease *AluI*. Fragments resulting from the digests were separated on an agarose gel to detect restriction

fragment length polymorphisms (RFLPs). The IGS region for the selected isolates was also sequenced using a ABI PRISM™ 377 DNA sequencer. RFLP profiles and sequence data revealed that the isolates originating from the plantations in South Africa are distinct from *A. mellea* and *A. heimii*. We believe that they represent an undescribed species of *Armillaria*.

?????? HAVE YOU HEARD ????????

That *Armillaria mellea* was introduced into Cape Town by early Settlers about 300 years ago?

Screening and selection of *Eucalyptus fraxinoides* for tolerance to *Phytophthora cinnamomi*

Phytophthora cinnamomi is one of the best known and most notorious root pathogens of woody plants. Included in an extremely wide host range of this fungus is *Eucalyptus fraxinoides*. This is a desirable species for commercial production, because of vigorous growth on colder sites and, excellent pulping properties of wood. In South Africa, *E. fraxinoides* suffers from high mortality, that starts at establishment and is thought to be caused by *P. cinnamomi*. The aim of this study was to select families of *E. fraxinoides* with improved tolerance to *Phytophthora* root rot. Seeds from local selections and from a number of Australian families were established at two sites known to be affected by the root-rot complex. The trials were measured at 28 months for survival and diameter. At 30 months, stems of trees at both sites were inoculated with a virulent isolate of *P. cinnamomi* (CP470) and lengths of resulting lesions were measured. Families were ranked according to their susceptibility to disease as determined by lesion lengths and mortality. Family ranking in the two trials was compared using Spearman's ranking correlation. Tree diameters and lesion lengths were also combined in a multiple trait selection index to assist selection of the best trees within families for growth and disease tolerance. There was a significant correlation in family ranking for lesion length at the two trials. This indicated that stem inoculation of young trees could be used as a reliable method to determine tolerance to *P. cinnamomi*. Family ranking by mortality within site, was significantly correlated with lesion lengths at only one of the sites. Mortality at that site was very high (52%), indicating that selection based on natural infection might only be meaningful on sites with a high inoculum density. The multiple trait selection index was constructed using both

family and individual tree information. The lesion length components were negative, as the higher the score, the more susceptible the tree and therefore less desirable.

The canker pathogen *Botryosphaeria dothidea*, as an endophyte of *Eucalyptus* spp. in South Africa

Botryosphaeria dothidea is a stress-related die-back and canker pathogen of *Eucalyptus* in South Africa. The pathogen is, however, also a natural endophyte in healthy *Eucalyptus*. Isolations from healthy *Eucalyptus* leaf tissue have yielded *B. dothidea* as the dominant symptomless endophyte taxon from *E. grandis*, *E. nitens*, *E. smithii* and *E. camaldulensis* leaves. The occurrence of *B. dothidea* in *E. grandis* leaves, as the dominant endophyte, is consistent over time and geographical area. No specific infection patterns were observed and the fungus appears to infect all leaf parts. Germ tubes of *B. dothidea* originating from conidia on leaf surfaces, penetrate stomata directly and become established in leaf tissue. The numerous infections in individual leaves are the result of infections by distinct genetic entities of *B. dothidea*. This indicates that the pathogen is probably native and sexually outcrossing in South Africa.

Coniothyrium canker: a serious new disease in South Africa

Eucalyptus spp. are an economically important forestry resource in many parts of the world. A number of diseases result in serious losses to this forestry species. Recently, a very damaging stem canker disease has appeared on plantation-grown *Eucalyptus* clones and hybrids in sub-tropical parts of South Africa. The disease was first observed in KwaZulu/Natal and is now widespread in the country. The disease is typified by the appearance of discrete necrotic lesions that coalesce to form large, kino-impregnated cankers and stem malformations. The causal agent has been identified as a new species of *Coniothyrium* described as *C. zuluense*. Numerous *Coniothyrium* species are known to infect *Eucalyptus* leaves and stems. Based on conidial size and shape, *C. zuluense* can easily be distinguished from other species capable of infecting *Eucalyptus* tissue. Considerable success has already been achieved in selecting clones and hybrids of *Eucalyptus* spp. for disease tolerance. Current studies are concentrating on developing screening techniques to rapidly identify tolerant planting stock.

Diversity of *Cryphonectria cubensis* isolates in Venezuela and Indonesia

Cryphonectria canker, caused by *Cryphonectria cubensis*, is one of the most destructive fungal pathogens of *Eucalyptus* spp. The disease is favoured by high rainfall and temperatures above 23°C. It is, therefore, considered to be a major problem in the tropics and sub-tropics where eucalypts are grown extensively in plantations. Both South America and Indonesia have been suggested as possible areas of origin of *C. cubensis*. In this study, we examined the diversity in two populations (Venezuela and Indonesia) of *C. cubensis*. Vegetative compatibility groups (VCGs), representing different genetic entities, were determined by pairing all isolates in all possible combinations. Considerable genetic diversity was found amongst isolates from both Venezuela and Indonesia. This is probably due to the high level of sexual recombination which was also observed in these areas. The data suggest that the fungus has been present in Venezuela and Indonesia for extended periods of time. Therefore, it is not currently possible to resolve the question of the origin of *C. cubensis* at this stage.

Possible biological control of *Cryphonectria* canker of *Eucalyptus*

Cryphonectria cubensis is an important pathogen of various *Eucalyptus* spp. in the tropics and sub-tropics. This canker pathogen has severely limited the development of susceptible *Eucalyptus* plantations in areas where climatic conditions favour disease development. Double-stranded RNA (dsRNA), which can be associated with reduced virulence (hypovirulence), has been found associated with some South African and Brazilian isolates of *C. cubensis*. These dsRNA-containing isolates showed morphological characteristics suggestive of hypovirulence, and were significantly less virulent than dsRNA-free isolates in pathogenicity tests. Conversion of virulent isolates with normal morphology to hypovirulence was achieved by pairing hypovirulent and virulent isolates of the same vegetative compatibility group (VCG). DsRNA could thus be transmitted to isolates of the same vegetative compatibility group by hyphal anastomosis. Converted isolates exhibited the same composition of hypovirulence-associated traits as those of the original dsRNA-containing hypovirulent

isolates. These studies indicate that dsRNA alters both morphology and virulence, by conferring hypovirulence to the pathogen. Further studies are now required to test the feasibility of implementing biological control of *Cryphonectria* canker via hypovirulence.

Diversity among isolates of *Coniothyrium zuluense*: A newly recorded *Eucalyptus* stem canker pathogen in South Africa

Coniothyrium canker caused by *Coniothyrium zuluense* is a serious stem disease of *Eucalyptus* spp. in sub-tropical parts of South Africa. The disease is typified by necrotic stem cankers, that coalesce to form large kino-impregnated cankers along the stems. The strategy currently being used to manage *Coniothyrium* canker is to make use of tolerant *Eucalyptus* species or clones. Considerable success is already being achieved in this regard, but the long term durability of tolerance will depend on the genetic diversity of the pathogen. In this study, 280 isolates of *C. zuluense* were compared based on growth characteristics, spore morphology and virulence. Results indicate that *C. zuluense* in South Africa is represented by a genetically diverse population. This is indicative of a well established, and possibly endemic fungus. It is thus likely to adapt to virulence on new clones and hybrids that have been developed to avoid this and other diseases.

?HAVE YOU HEARD?

The first meeting of the Society for the Publication of Outrageous Findings (SPOOF) was hosted by the TPCP during November 1997!

Characterisation of a dsRNA virus in the pine pathogen *Sphaeropsis sapinea*

Double-stranded RNA viruses are widely distributed in fungi. In some plant pathogenic fungi, their presence is associated with hypovirulence. A 4kb, linear dsRNA element has recently been isolated from some South African isolates of *S. sapinea*. This fungus is an opportunistic pathogen of pine species world wide. However, it can live as a symptomless endophyte preferentially in healthy pine cone tissue and seems to remain latent until the onset of stress. The nature and function of the conservatively transmitted dsRNA genetic element in *S. sapinea* is a tantalizing question, especially because of the potential for biological control of the pathogen, through hypovirulence. The sequencing of the reverse transcribed virus genome was important to obtain a molecular tool for further characterisation of the virus.

Comparison of the partial sequence of the virus genome with data bases showed strong homology to the RNA dependent RNA polymerase of the Leishmania virus

(Totiviridae). Weak homology was also found to the coat protein of this protozoan dsRNA virus.



Jolanda Roux visits the United States

Ceratocystis albobundus is an important pathogen of *Acacia mearnsii* in South Africa that is capable of killing susceptible trees within weeks. As reported in the previous issue of this newsletter, Prof. Tom Harrington, who is an internationally recognised expert on *Ceratocystis* species, spent his sabbatical with the TPCP. He is currently doing research on plant pathogenic *Ceratocystis* species and thus showed great interest in *Ceratocystis* wilt of *A. mearnsii*. He also provided the opportunity for me to visit and work in his laboratory for a five week period in July and August.

During Tom Harrington's visit to South Africa we improved the isolation technique used for *C. albobundus*. This resulted in the collection of more than 40 isolates from different geographic areas. Mike Wingfield and Tom Harrington even collected *Ceratocystis* from a jungle stand of wattle near East London during their vacation there! Isolations were also made from Umkomaas, Pietermaritzburg and surrounding areas, Vryheid and Piet Retief and included one from *Acacia decurrens* (green wattle). This suggests that the host range of the pathogen is beyond *A. mearnsii*.

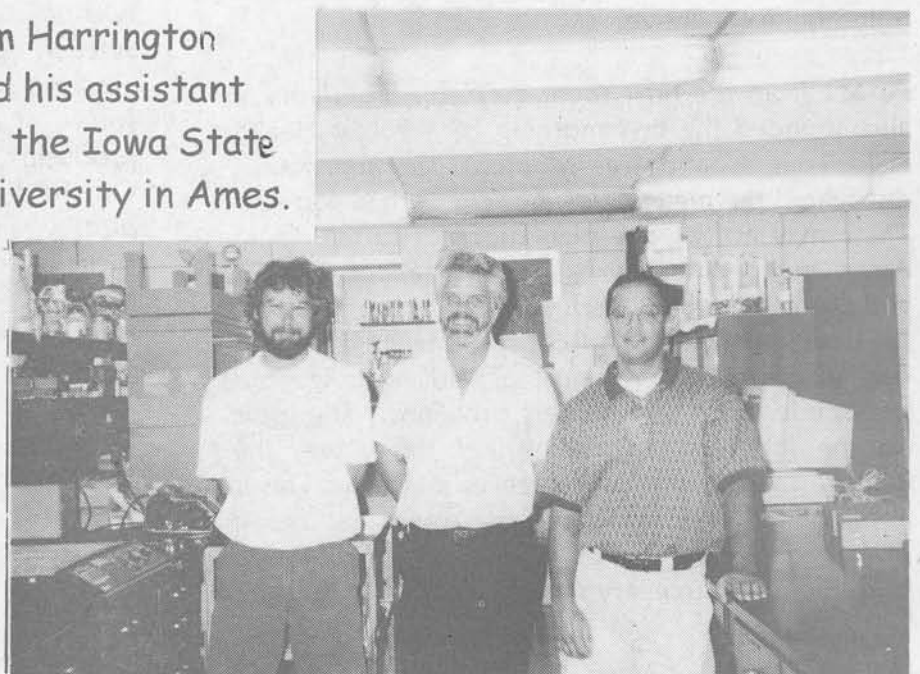
There are many important questions regarding the pathology of *C. albobundus* that require answering. Two of the most relevant questions are whether this fungus is native to South Africa, and what its prevalent mode of reproduction is. The answers to these questions impacts directly on the future control of *Ceratocystis*

wilt. The first report of *C. albobundus* was from a *Protea* sp. near Sabie. This, together with the fact that it is not known from other countries, suggests that the fungus may be native to South Africa. To determine the origin and evolutionary development of a microbe, it is necessary to study the population of the organism. Tom Harrington and a post-doctoral student in his lab have developed an excellent technique to determine the size of fungal populations. This technique has already been applied to a range of fungi and we hoped that it could be applied to *C. albobundus*. The main objective of my visit to the United States was thus to learn this technique and bring it back to South Africa.

We had great success with the population study and results from the initial experiments strongly support our hypothesis that *C. albobundus* is native in South Africa. Results also suggest that the fungus has an active sexual state, ensuring a diverse population. This impacts directly on any selection of disease tolerant trees that will be done in future. Genetic diversity will increase the possibility of the pathogen overcoming the trees defence mechanisms, thus necessitating a more active breeding programme.

Tom Harrington's lab is at the Iowa State University in Ames, Iowa. Ames is a university town about 30 miles north of Des Moines, the capital of Iowa. Just like the Free State, Iowa has no

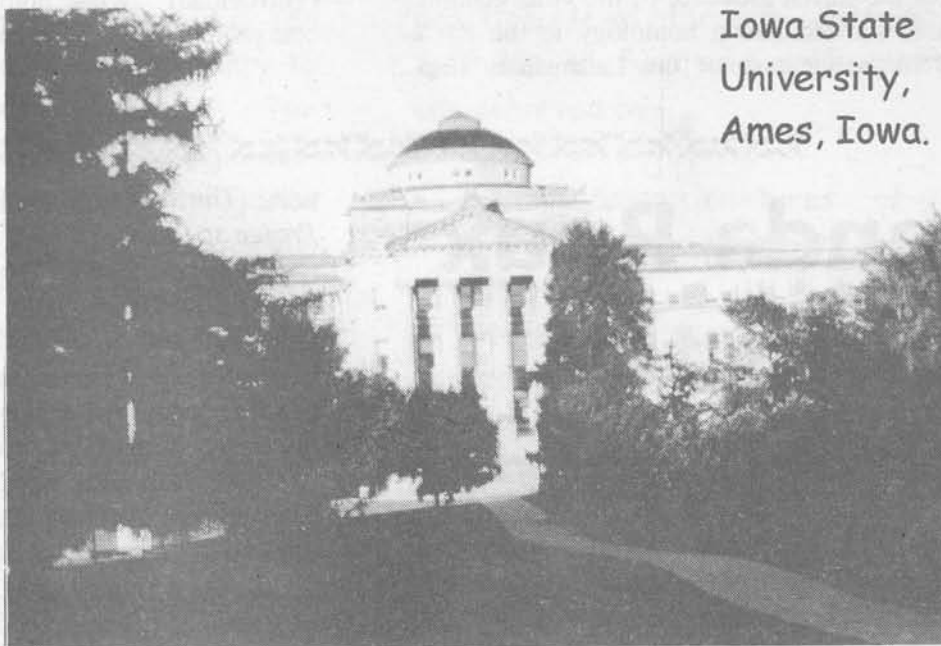
Tom Harrington
and his assistant
at the Iowa State
University in Ames.



commercial forestry and consists of fields upon fields of maize and soya bean. The topography is very similar to that of the Free State, so in that sense, I felt right at home. It was still summer when I arrived in Ames and to my surprise, I discovered that it becomes extremely humid, so that I often thought I was in Kwambonambi! I was delighted to see the number of trees in the towns. My

first general impression was one of awe at the lush green sight, but then this might also be because of the rather grey Free State winter from which I had just come! What interested me even more, was all the different diseases that the people have to study, right in their front gardens! I had the chance to see all the classical diseases that we learnt about in text books and those Mike spoke about in our third and honours years. *Ceratocystis* spp. were everywhere and many oak trees in Ames suffer from oak wilt caused by *C. fagacearum*. What was amazing, was the extent to which many people would go to save their oak trees. These trees are more than one hundred years old and are thus extremely valuable, both for their wood and also for their aesthetic value. Many people will pay \$ 400 for a fungicidal treatment of a single diseased tree. This treatment has to be repeated at least once to be successful, and is thus quite expensive.

Apart from the time spent in Tom's laboratory, I also attended the first morning of a Forest Health Field Tour around Des Moines. On this tour I discovered the meaning of the term, urban forestry. There may not be any plantations or forestry near Ames, but people are very serious about diseases and Des Moines has a permanent forester to tend to the trees in the city. On this trip we again looked at oak wilt, *Armillaria* root rot of various indigenous tree species and various insect problems. The topic on the foresters tongues at that stage, was the damage cause by the seventeen-year cicada. This is a periodical cicada (*Magicicada* spp.) that has a seventeen year life cycle. These insects only emerge from the soil once every seventeen years to lay their



Iowa State
University,
Ames, Iowa.

eggs in small branches and twigs, causing extensive die-back. When the young nymphs emerge they drop to the ground, burrow into the soil and start their seventeen year cycle. Of course, there are new insects emerging each year at the end of their specific 17 year "sleep".

Besides my visit to Tom Harringtons laboratory I also attended a workshop entitled "Enhancing the productivity and sustainability of short-rotation Salicaceae" in Syracuse in New York State, where I presented a paper on the diseases affecting the poplar industry in South Africa. This workshop is a yearly event and is sponsored by the International Energy Agency. This year it was hosted by the SUNY College of Environmental Science and Forestry and consisted of two days of formal presentations and active discussions, followed by a two day field tour. Countries such as the USA, UK, Sweden and Holland are actively involved in growing poplar and willow clones, as a renewable source of energy in place of coal. This method of producing energy also produces a lot less pollution. On the field tour we visited several experimental plots where different clones are being tested for their performance and general pest and disease resistance. We also visited a biomass heating facility where they make use of these trees for producing energy.

Directly after the workshop in Syracuse I attended the Annual Congress for the American Phytopathological Society in Rochester, New York. This congress started with a forest pathology field tour to Letchworth State Park. What I found

amazing was the fact that very little of what I saw was akin to commercial plantation forestry in South Africa. Many of the diseases that these pathologists study, are on their indigenous trees, something that we South Africans tend to ignore. One of the more controversial and interesting topics of the Forest Pathology section of the congress, was a talk by Dr. Paul Manion, entitled "A healthy amount of disease". He stated that if you do not have diseases in your forest, then your forests are not healthy. Diseases ensure that only the stronger trees survive and creates room for new vegetation in natural forests. Not something that we want in South African forestry! Many of papers at the congress also dealt with the molecular identification of plant pathogens, the influence of Vegetative Compatibility

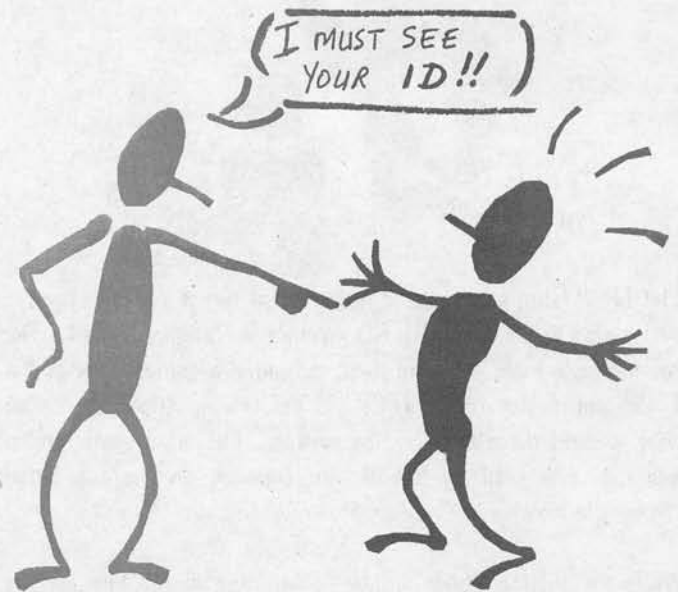
Groups on the transmission of hypoviruses between strains of *Cryphonectria parasitica*, the chestnut blight fungus, and on *Armillaria* root rot of pines.

My five weeks in the United States came to an end much too quickly. This is probably due to the fact that I was so busy all the time. Rarely was there a moment that I did not learn something new about pathology and mycology. The Harrington's and the other people I met made my stay all the more enjoyable. All the forest pathologists and foresters went out of their way to show me diseases and other interesting aspects of American forestry. It was truly a memorable trip, made possible by Prof. Tom Harrington, Mike and the TPCP. Thank you!!

Three TPCP team members attend the American Phytopathology Society (APS) Meeting in the USA

Oliver Preisig reports on this visit

The 1997 APS congress, which is an annual event, was held in Rochester, New York in August. This meeting was attended by three TPCP team members. While Brenda (Wingfield) was a well known attendee, Jolanda (Roux) and I were first timers both to the APS and to the USA. This congress was a great opportunity for us to get exposed to the "American way of life". Fortunately or unfortunately, Rochester is not exactly a main tourist attraction. The city centre, where the venue was situated, was uninhabited over the weekend. The only life was that of the 1500 starving participants who went hunting for food and found that all the restaurants/fast food outlets were closed. Even if you did get food other problems arose. In an Asian restaurant the waiter wanted to see my ID document as he was convinced I was



under 21 and could therefore not drink wine. My colleagues found this hysterically funny. We took one morning off to see the Niagara Falls, one and a half hours from Rochester. Due to our generous nature we invited another South African, Dr Cheryl Lennox, to join us. The falls are pretty impressive and we paid quite a few dollars to get soaked. Attending an international meeting is not just about food and site seeing, the scientific programme was just as exciting. There were a number of participants and presentations and many parallel sessions were held. We found the meeting to be highly informative and it gave us the opportunity to meet internationally recognised scientists. We could also, of course, promote the TPCP!!!!

?????? HAVE YOU HEARD ???????

Mycorrhizae have the capacity to transfer nutrients from large trees to small seedlings in the shade of the understory!

Amplified fragment length polymorphism (AFLP) technology

Dr Marianne Wolfaardt attended the first Gibco BRL AFLP Workshop, at the Department of Plant Biotechnology and Pathology, INFRUITEC, during the week of 21-24 October 1997.

Amplified fragment length polymorphism (AFLP) technology is a novel and powerful DNA fingerprinting technique. When the fingerprints of closely related plants are compared, fingerprints are generally very similar. When differences are observed in an otherwise identical fingerprint, such differences are referred to as DNA polymorphisms. DNA fingerprinting is used to visualize DNA polymorphisms between individual

samples. These fingerprints may be used as a diagnostic tool for determining the identity of a specific DNA sample or to assess the relatedness between individual samples. Fingerprints are also used as a source for genetic markers to generate linkage maps or to identify molecular markers lined to phenotypic traits and/or genetic loci

The TPCP group will, in future, use this technique, in combination with other molecular techniques such as RAPDs and RAMS, for typing of individuals, identification of molecular markers, and mapping of genetic loci.



POSTERS STOLEN IN SALVADOR

The TPCP team were amazed to learn that two of our prize posters were stolen at the recent IUFRO meeting in Salvador, Brazil. The one poster, a most colourful item, presented a general view of the TPCP and its activities. TPCP pamphlets were attached with an offer to send these to interested parties. The other poster stolen was that presented by Schalk van Heerden on the population diversity in isolates of *Cryphonectria cubensis*.

While the theft of these posters is irritating and a loss for the TPCP, we also have to view this as a compliment. I don't think I have ever heard of scientific posters being stolen in the past. This must certainly illustrate a tremendous desire on the part of the thieves to have original copies of our material. Last year two of our

students won prizes for best presentations at the American Phytopathological Society meetings which was a great compliment to the TPCP. The theft of our posters this year must match that accomplishment!!

PS We also heard that clonal plants were stolen by delegates visiting a nursery during a pre-congress tour!!! This must be the ultimate example of a lack of knowledge of the dynamics of clonal forestry. A clonal plantlet is, of course, of no value prior to a rigorous period of testing. In this sense it is of little more value than a single seed – which would also represent a single individual in a population. And one has to wonder about the quarantine implications of this theft!

THE RESEARCH TEAM OF THE TREE PATHOLOGY CO-OPERATIVE PROGRAMME

The research team of the Tree Pathology Co-Operative Programme is varied. It includes full time staff of the University of the Orange Free State (Prof. M.J. Wingfield, Director and Mondi Professor, Prof. B. Wingfield, Dr T.A. Coutinho, Ms J. Roux and Mr F. Wolfaardt), colleagues and students attached to other organisations such as the ICFR, technical assistants funded by the University or through membership fees and post graduate students who are mainly funded by the FRD. Staff from various Departments in the University obviously provide advice and support where this is required.

MESSAGE PRESENTED AT THE TPCP YEAR-END FUNCTION

By Mike Wingfield

I must firstly welcome all of you to our annual year-end function. I extend a special word of welcome to our visitors – Dr. Cheryl Lennox who is visiting from Oregon State University and to the Hudler family with us on sabbatical – and who can now, after some four months, hardly be considered to be visitors any longer. Then I must once again welcome the extended family of the TPCP, the wives, husbands, children and other significant, of our immediate team. As I have certainly said many times in the past, the TPCP family is an extended family – for those of you who witnessed the presence of TWO SETS OF TWINS in the laboratory, you will know what I mean by this.

The millennium rushes to an end. In only two years time we will be attending not only year end parties but we will also be celebrating the end of the Millennium. There are not many people that can claim to have lived through such an event. My father, who was born in 1918 – almost 80 years ago – used to talk of his father's stories of parties at the end of the last Century – and this will not be the end of a 100 year period – but the end of a 1000 year period. It is said that at the end of the last Millennium, some parties lasted for a year. To me, one of the remarkable aspects of the turn of the Millennium is that the event stimulates us to analyse the past – and yet also look to the future.

Before I become obsessed with my own perspectives of the Millennium past, let me rather concentrate on the passing of 1997. Again this has been a remarkable year for the TPCP and its family. And I must again say what I great pleasure it has been for me to guide such a wonderful and enthusiastic group of people.

AN EXCHANGE OF FACES

As is typical of the TPCP, there is a rather active exchange of faces in the group. Chris Viljoen left after completing his PhD and a new group of honours students (Marika Venter, Juanita de Wet, Edzard Grimbeek, Johannes (Breekker) van der Merwe, Carin Dunn and Albie (Meteorite) van der Merwe) joined us. Tom Harrington and family arrived for a six month sabbatical (sadly to leave at mid-year), George Hudler and family arrived at mid-year for their six month sabbatical, and Percy Chimwamurombe from Zimbabwe joined the group to undertake a PhD. Daniel Dalevi from Sweden came to the end of his year of study in mid-June and Karin Wilkler from Tom Gordon's lab in the United States spent about six months with us in the first quarter. George and Fanny Carroll from the University of Oregon left in September after spending all of seventeen months of George's sabbatical with us. Over and above all of these comings

and goings we also enjoyed shorter visits from a large number of scientists from various parts of the world.

Corli Strydom (Witthuhn) returned from study leave in Iowa; Cassi Myburg left for Oxford early in the year and returned some months later, Wouter de Lange spent some months in the laboratory of Dr. Gindi Oeamb in Minnesota and a good number of the group attended congresses in various parts of South Africa but also outside South Africa. In fact just this evening we welcome back Len van Zyl after his few months wandering around South America – after attending the IUFRO eucalypt meeting in Salvador.

It would be quite impossible to summarise the many accomplishments of the TPCP during the past year. The group has grown so much and we must certainly represent the largest single group of forest pathologists (sensu lato) in the world. Degrees have been obtained (Henriette Britz, Zander Myburg, Cassi Myburg cum laude), excellent papers have been published and numerous scientific breakthroughs have been made. As I said at the start of this letter, one can only but feel proud of being part of this great research family.

On the personal side there have also been many breakthroughs and accomplishments – probably many more than I can remember, or perhaps even know about!! Some of the more remarkable events were the arrival of Michelle and Liesel to Karin (with Martin, one of our two recipients of FRD prestige bursaries) and Rudi Jacobs, and shortly thereafter, the arrival of Tanga and Bianca to Wouter and Melanie de Lange. Corli Strydom caught a white hen – or perhaps she was caught!! – and thus Leon Witthuhn also joined the family; and in just a few weeks time Bernard Slippers will marry the lovely Jana.

The marriages make me think of the story of the King and Queen and gorgeous princess that lived in a splendid castle in an ancient mountain Kingdom. The lovely princess loved animals dearly and spent much of her time roaming the fields in communication with deer and other abundant wildlife. One day, she came across a frog that was in poor health. She took care of the poor frog all day and that evening, she took the frog to bed with her to keep it warm. In the night the frog turned into a handsome prince. The prince and princess fell deeply in love, got married and lived happily ever after. But the King and Queen never believed the story about the frog!!!

THE COMING YEAR

After many months of agonising at the start of this year, the decision was made to move the TPCP and its "sister"

the FMB to the Campus of the University of Pretoria. As you all know, this move will begin in just a few weeks time. Brenda (Wingfield) moves her lab in the first week of December. By January, quite a few of you will no longer live in Bloemfontein. We expect that by June next year, the move will be complete and the new Forestry and Agricultural Biotechnology Institute (FABI) will be fully functional.

Contemplating the move from Bloemfontein is not easy. Any move is difficult and the extent of this one makes it even more overwhelming. Houses need to be sold, possessions packed, new homes found and much much more. While this move will involve some considerable stress for all of us, it will also bring with it new challenges and excitement. By far the larger part of our group will move to become part of the great new FABI in Pretoria. What is hard for me to accommodate is the fact that some of you will not move with us. Many of us have been together for a long time and it will be most difficult for us to take leave of you. What I do want you to know is that your contributions to the TPCP will always be remembered and that we will always consider you part of the TPCP family.

The thought of leaving Bloemfontein has focused my thoughts on this charming city and all it has to offer. One so easily forgets how easy life is here. Ten minutes to work (from almost anywhere), ten minutes to the airport

and ten minutes to town. What I am rapidly realising is that after ten years I still hardly know Bloemfontein. Just last week I visited the "Ou Presidentsie" which is a most wonderful home. Beverly was greatly interested in the fact that the many bedrooms have no bathrooms. I tried to explain to her that the chamber pots in each of the rooms were there for those little emergencies in the night. This also reminded me of a story I once heard....

A nun was driving from Durban to Pretoria when she ran out of petrol. She proceeded to walk to the nearest town where she found a small petrol station – but it was closed. The owner of the petrol station was happy to supply petrol but did not have a container in which to put it. After much searching the only container that they could find was an old chamber pot. So the nun went back to her car and proceeded to fill the tank from the so called potty. Just then a truck drove by and stopped to witness the event. The driver said "My dear – I cannot claim to follow your religion but my goodness, I do admire your faith".

As we rapidly approach the end of the year and Christmas, I want to take this opportunity to wish you a very joyous festive season. For the coming year, which will encompass substantial change for all of us, I and the TPCP family wish you and yours a most prosperous and happy 1998!

IMPORTANT : PLEASE READ THIS

In order for us to co-ordinate our services to you please help us by using the following contact address:

Postal address:

*Tree Pathology Co-operative Programme
For attention Prof. M.J. Wingfield
Dept. Microbiology and Biochemistry
University of the Free State
P.O. Box 339
Bloemfontein 9300*

Courier address:

*Tree Pathology Co-operative Programme
For attention Prof. M.J. Wingfield
Microbiology and Biochemistry Building
Dekaans Street
University of the Free State
Bloemfontein 9300*

Tel: 051 - 4012581

Fax: 051 - 4482004

E-mail: WingfiMJ@micro.nw.uovs.ac.za

Webpage: <http://www.uovs.ac.za/nat/mkboc/tpcp.htm>
