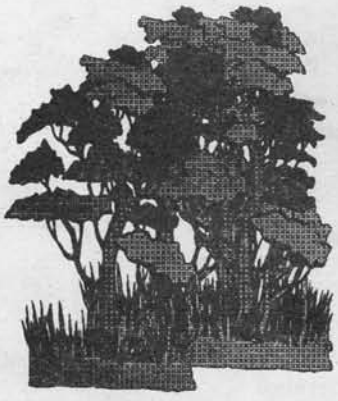


TREE PROTECTION NEWS

Newsletter of the Tree Pathology Co-operative Programme - University of Pretoria

NO 3

May 2002

CONTENTS

from the desk of the director

News from the TPCP comes in a variety of forms. Our two full-length newsletters, such as this one, are dispatched with ICFR news twice each year. For the intervening quarters, we provide a shorter series of news items, also for dispatch via ICFR News. This system of dispatch has been in operation for a few years now, and seems to operate efficiently and to draw positive feedback. I am particularly grateful to Jolanda Roux (TPCP) and to Lauren MacLennan (ICFR) for their great contributions to ensuring that our news is widely distributed throughout the SA Forest Industry. The TPCP also has many other forms of communication with its constituency, including an excellent series of online web pages, field days, lecture series, pamphlets and more. All of these and the newsletters, help to maintain close contact between forest managers, foresters and researchers, distributed over a very large area.

Speaking of distributing news and knowledge, reminds me of the fact that the annual meeting of the TPCP has just passed. This year, we had just over 100 guests in Pretoria for the meeting, which included a very full scientific and social programme. As in the past, the annual meetings of the TPCP are much more than a series of lectures presented by staff and students attached to the TPCP. This event provides one of the small number of opportunities for researchers, research managers and foresters from a wide variety of organisations to interact and to share experiences. It has been our experience in the past that many new initiatives of common interest to people from different backgrounds have emerged from TPCP meetings. It is for this reason that we have included substantial time for social interaction. In addition to the main body of the meeting, we again arranged tours of our outstanding facilities. These included the main FABI research facility, the rapidly growing DNA sequencing and microarray facilities, as well as our nursery and forest tree "gene garden"

Thinking of facilities reminds me that our next TPCP meeting is likely to include a very exciting new initiative that is on our horizon. After many months of negotiation and strategizing, we have recently heard that the University of Pretoria will provide approximately R15 million towards the expansion of FABI. For the TPCP, this is a wonderful new opportunity. It will provide not only expanded laboratories but world class facilities for tissue culture and genetic modification of trees, quarantine level green houses, greatly expanded facilities for bioinformatics and enhanced facilities to promote our growth in forest entomology. Although the plans are only just being drawn, and the two little houses alongside FABI are yet to be demolished, I hope that we will be able to hold part of our next annual meeting in these new facilities. It will be wonderful to be able to have you join us in this milestone event in the path of our growth and development.

The South African forestry industry is, without question, in the midst of one of the greatest periods of change in its history. This is an industry that is by no means the largest in terms of planted hectares, but is yet one of the better known and more successful players internationally. Its high profile has emerged over many decades and is closely linked to the passionate commitment of visionary entrepreneurs and researchers. Just the other day, I was looking back to some of the work of the South African entomologist Tooke who is

credited with the first work on biological control of insect pests in forestry. His research in the early part of the last Century leading to the biological control of the Eucalyptus snout beetle, *Gonipterus scutellatus* in South Africa, continues to provide substantial benefit to the productivity of our plantations. Let us not forget the tremendous contributions of our pioneer forefathers. At the same time, we must continuously remind ourselves of the importance of research, new ideas and new initiatives. Some will be more productive than others. But they are the foundations of the future for which we hold the responsibility. Thus, in this period of change in forestry, I believe that it is crucially important, while harnessing the opportunities of change, to build on the foundations that have grown from past visions. The TPCP is one of these foundations that has emerged from the vision of many people that have preceded us.

One of the great attributes of the TPCP is that the programme represents a remarkable team effort. This includes not only those belonging to the research team, but also staff of member organisations. Recently, on a trip to New Zealand, I noted a list of key beliefs that the Ministry of Agriculture and Forestry (MAF) adheres to, and thought that these also closely represent those to which we adhere. They are as follows:

- **The customer's needs are critical**
- **Anything can be improved**
- **Quality is everyone's job**
- **The person doing the job knows best**
- **People deserve respect**
- **Teamwork works**
- **There is value in difference**
- **Involvement builds commitment**
- **Support builds success**
- **You make the difference**

I sincerely hope that you will find this first full edition of Tree Pathology News for 2002 interesting and useful. I would also like to thank you and all members of the TPCP for their support. The TPCP is, in every way, a team effort. It's success thus relies on the commitments and contributions of many people. We are grateful for the opportunity to work as part of this tremendous team.

Mike Wingfield

"KEEPING TREES HEALTHY"

Bluestain or sapstain : what is it ....

If you mention the word 'bluestain', many a forester would know that you are referring to the blueish, or more often greyish, discoloration occurring on wood some time after harvest. In severe cases the stain can even become black, especially in resinous species like *Pinus elliottii*. The name 'bluestain' is, however, somewhat of a misnomer, since in reality, the stain is seldom blue. What is true, though, is that this type of stain only occurs in sapwood, and never in heartwood. In cross sections of pine logs, the yellowish heartwood is often left unstained while the complete sapwood area becomes stained. This is then the reason why scientists are increasingly using the more appropriate term 'sapstain.'

Most people working with wood will know that sapstain is caused by fungal infection of the wood. A common misconception, however, is that the stain is the result of chemical discoloration of the wood fibre. This is not the case. The discoloration is merely an optical illusion in the sense that pigmented hyphae (thread-like fungal structures) penetrate and grow into the ray parenchyma cells, tracheids and resin canals of the wood. What is perceived by the eye as a discoloration of the wood, are thus the dark fungal hyphae present in the hollow wood cells.

Research has shown that sapstain fungi have very little effect on wood structure, if any at all. Most sapstain fungi do not degrade cellulose or lignin and, therefore, does not affect the strength of the wood. They do, however, have the ability to effectively break down and remove resinous compounds. This explains their role in nature: when a living tree falls over, or a branch breaks off during a storm, sapstain fungi are the first to attack the fresh wood. Pitch is designed to protect wood from fungal and insect penetration. The sapstain fungi, however, have the necessary enzymes to break through this pitch barrier, and literally consume the pitch in the wood as food. They 'open up' the wood to other degraders such as white rot (lignin degrading) and brown rot (cellulose degrading) fungi. Sapstain fungi are, therefore, considered primary colonizers and act as the first components in the natural degradation of the wood.

Read more about the infection of wood by sapstain fungi in the next issue of Tree Protection News.

DISEASE ALERT! it's a pink disease

Right: Stem canker and pink mycelial growth caused by the pink disease fungus on a *Eucalyptus macarthurii* tree

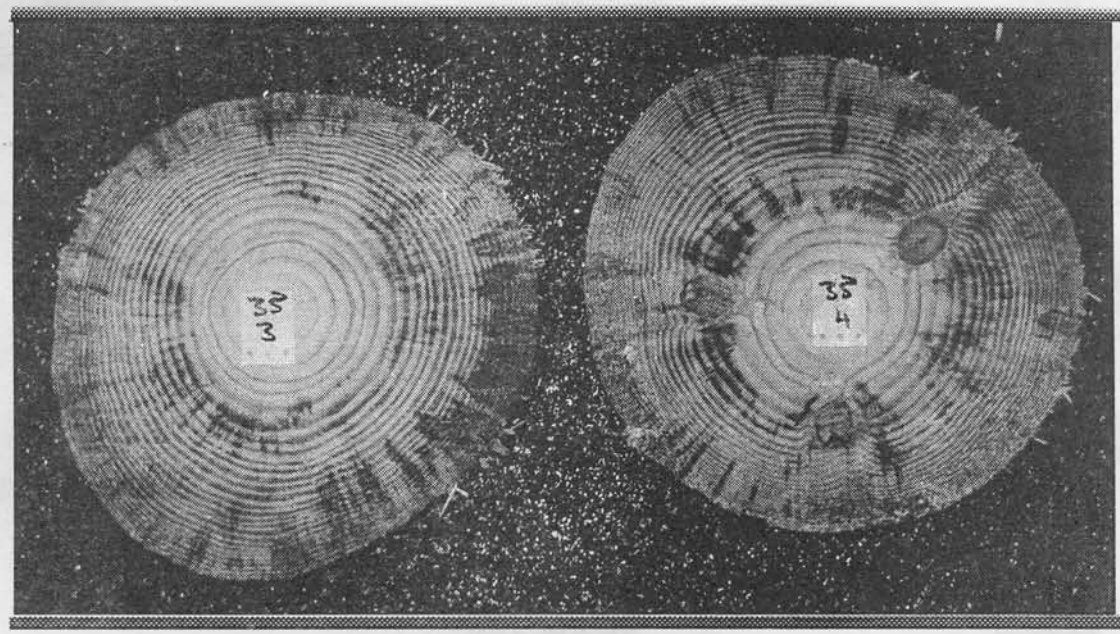
In the last year a number of reports of a strange disease, characterised by a pink growth on the bark of affected trees, have been investigated. The trees affected ranged from *Eucalyptus* sp., to *Acacia mearnsii* and also include some of our most beautiful native trees such as yellow wood (*Podocarpus* spp.) and the pompom tree (*Dais cotonifolia*). Symptoms of disease on all these trees are very similar, starting with the death of a branch or two, followed by the death of the main stem of the trees. Furthermore, the cankers are characterised by a pink/whitish growth between the cracks and on the surface of the bark. Trees eventually die.

The disease is known as "pink disease" and is caused by a fungus by the name of *Erythricium salmonicolor*, a basidiomycete. The pathogen has a world-wide distribution and causes disease of a number of important tree crops. These include *Eucalyptus* spp. in India and South America, *Hevea* sp. (rubber), cacao and stone fruit. Pink disease was first reported in South Africa in the 1950's from apple trees in the Free State and Natal. It was also reported, once, from *A. mearnsii* in the KwaZulu-Natal Midlands in the 1950's. These were the only two reports until the early 1990's when the disease was identified on *E. cloeziana* in a trial in the Midlands. Early in 2000, the disease was, however, identified as the cause of death of *P. henkellii* trees near Sabie, followed by reports on two other *Podocarpus* spp. near Sabie and one from *E. macarthurii* in the Midlands. At the end of 2001, the disease was found to be common in a commercial stand of *E. macarthurii* near New Hanover and early in 2002 it was found in stands of *A. mearnsii* in the Karkloof and on *D. cotonifolia* near Sabie.

When the pink/white fungal growth is not visible, the external symptoms of disease may be confused with other fungal diseases, including Botryosphaeria canker. Sporulation and fungal growth is especially common under moist conditions.

Conditions of high moisture are also extremely conducive to infection, which commonly takes place through a branch and then moves to the main stem to form a girdling canker on the stem. These cankers either result in breakage of the stem at the height of the canker, or the death of the tree. Trees often have multiple infections.

We would appreciate any information on this disease. If you think your trees are affected by it, please contact Jolanda Roux. We still know little about the disease and would appreciate information on soil types, asects, seed sources etc. in building a disease profile. Thank you to the friendly wattle farmers in the Karkloof who have already helped.



Left: Blue stain. *What is perceived by the eye as a discoloration of the wood, are the dark fungal hyphae present in the hollow wood cells.*
(Article on p 2)

Saasveld forestry students link with TPCP

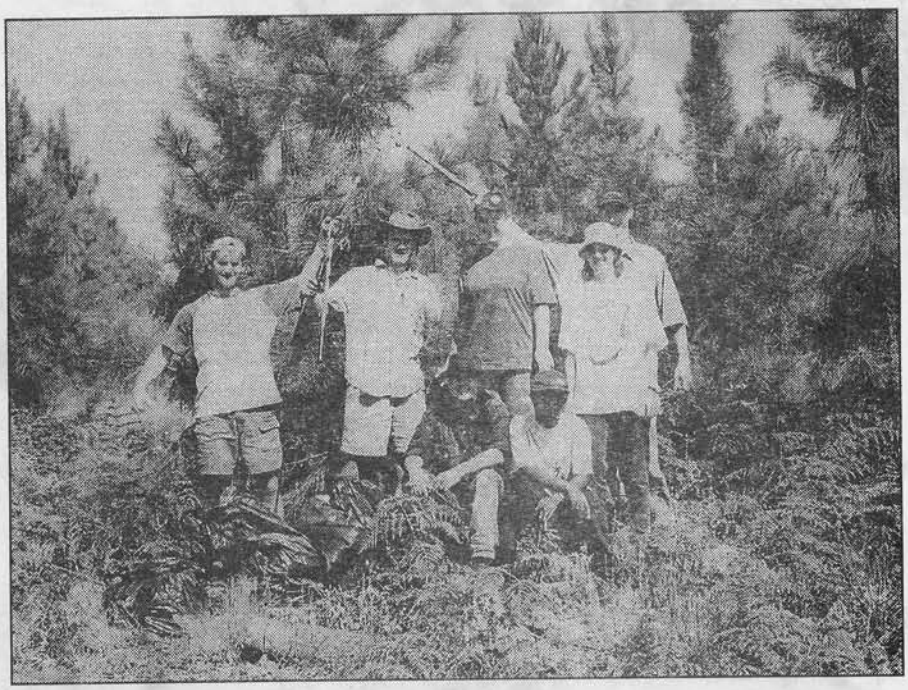
The successful management of pest and disease problems in forestry is strongly dependant on education and training. For this reason the TPCP is dedicated to extension and training of as many foresters and forestry researchers as possible. It was with great excitement that in 1999 we received our first Saasveld student for his final year practical semester. Ronald Heath, the first guinea pig, has completed his B.Tech and has joined the TPCP permanently. He is currently busy with the 2nd year of his M.Sc. degree on Cryphonectria canker of *Eucalyptus* spp. Following Ronald, Shelagh-Rose Pienaar joined us for her practical semester. She is now a silvicultural forester in Kwambonambi, after also completing her B.Tech.

This year the TPCP has the privilage to have its third Saasveld student conducting his final year practical semester in the group. Hardus Hatting joined the group in January and has had a busy few months in the TPCP, now not only learning about diseases, as in the past, but also about insect pests of forestry trees. Hardus agreed to write us a short note on his experiences the past few months. We hope that through his interaction, and that of our previous Saasveld students, we can entice more forestry students to come and learn about pests and diseases.

Hallo Foresters and fellow Saasveld students,

I arrived in Pretoria, at the TPCP on the 14th January 2002. I was immediately immersed in activity, going on my first field trip with 7 members of the group. With this field trip, the first of many, we went to Sabie where the TPCP has been screening *Pinus* hybrids for their resistance to one of the most serious pine pathogens, *Fusarium circinatum*. Six weeks prior to this trip the TPCP had artificially inoculated trees with the pathogen. On my first trip with them, we evaluated the results of these inoculations by measuring the level of infection in the different hybrids.

Since my first day at the TPCP I have been on a strong learning curve with regards to pests and diseases of plantation forestry trees. This has included both practical field experience in the identification and management of pests and diseases, as well as laboratory techniques involved in identifying and studying these organisms. I have been assisting several students in the TPCP with their research projects, in this way learning first hand about the various pathogens and pests in South Africa, and also a few not yet in the country. I have learned to pour agar (food for the fungi), work with microscopes, extract DNA, grow fungi, score trees for their susceptibility to pests such as *Gonipterus scutellatus*, and fungi such as *F. circinatum*. I have also had the opportunity to investigate the death of some of our indigenous tree species, such as baobab and sweet thorn.



Saasveld student Hardus Hatting (left) with a group of TPCP students after reading a Fusarium inoculation trial at Sabie

Through the field trips I rapidly realised the importance of pests and diseases on plantation forestry in South Africa. The TPCP is the largest programme of its type in the world, with more than 10 years of experience in dealing with plantation diseases. In the last two years it has expanded its focus to also include insect pests, which in fact have a very close association with diseases. The increasing movement of people and products around the world has exacerbated problems of diseases and pests. There is a constant threat of new diseases entering the country and the TPCP must identify and formulate control measures for these diseases and pests before they cause epidemics and result in the South African industry losing millions of rands.

It is, therefore, very important that the forestry industry should spend more time in training students, focusing on Pathology and Entomology and their interaction with site preparation, planting of trees and the protection of the trees up to the harvesting process. There should be a more careful approach before site preparation and planting commences, making sure that fungal diseases and pests do not become dominant after the trees have been established. Many pathogens need wounds for infection and, therefore, pruning, weeding and thinning activities should be done cautiously. Monitoring and early detection of diseases is very important for quality control measures that will save the forestry industry a lot of money. As I learnt on my first field trip, the selection of new hybrids, clones and provenances, resistant to disease are crucially important for long-term sustainability in our industry.

During my field trips I realised how much more there is still to be learnt about fungal diseases and pests and the major impact they have on the forestry industry. Fires are regarded as a forester's worst nightmare, but the constant threat of diseases and pests is equally as important. Fungal diseases and pest will become more and more part of your every day work as a forester, especially once you start recognising their signs and impact. The only way we will be able to control it is when all the forestry companies work together with the TPCP to keep trees healthy!

My time in Pretoria has not been all work and no play. After my first field trip in January I was introduced to the larger TPCP/FABI group. I was really impressed with the warm welcome I received and it has been great fun becoming part of the FABI family. I have even learnt a new way of drinking beer by balancing it on my forehead!! Something I think every Saasveld forestry student should learn, as currently the scientists in the TPCP still don't have any real competition from foresters working for our major forestry companies. I can greatly recommend spending your practical semester in the TPCP.

Hardus Hatting

Evaluating the efficacy of the biocontrol agents of *Sirex noctilio*

The woodwasp, *Sirex noctilio*, oviposits its eggs, mucus and the symbiotic fungus, *Amylostereum areolatum*, into stressed pine trees. Together, the mucus and fungus are lethal to the tree. *S. noctilio* was first detected in South African plantations at Tokai, near Cape Town, in 1994. Soon after the discovery of *S. noctilio* in South Africa, the Plant Protection Research Institute released three introduced biological control agents that had already been successfully established in Australia. However, during a survey in July 2001, we found that *S. noctilio* had spread as far as Brenton-on-Sea, near Knysna along the east-coast. The status of the biological control agents has since been examined and the present results create reason for concern for the pine industry.

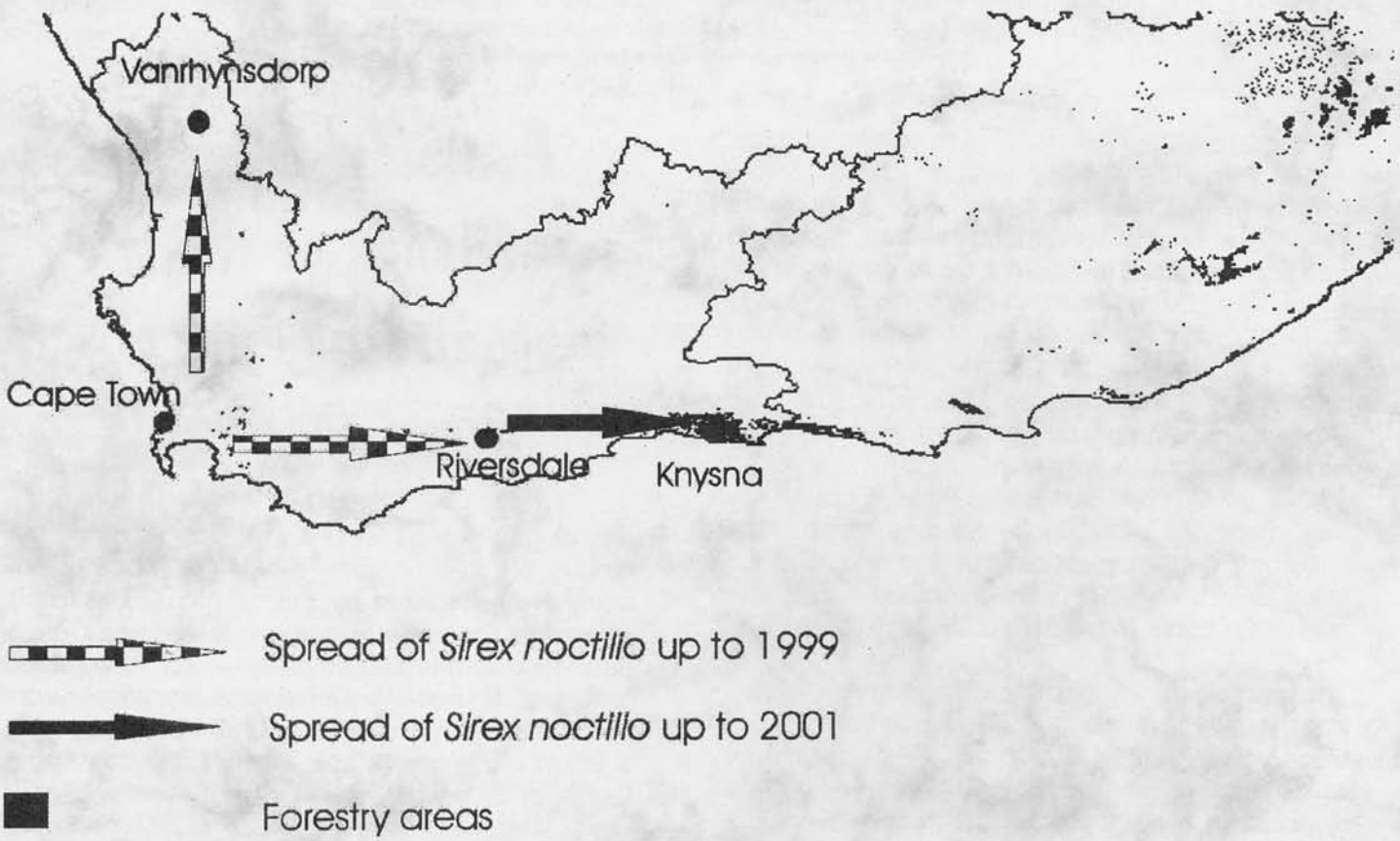
The primary biological control agent introduced from Australia was the nematode *Deladenus siricidicola*. *Deladenus siricidicola* lives in the tree while feeding on the fungus *A. areolatum*, a symbiont of *S. noctilio*. When *S. noctilio* larvae are present, the nematode produces parasitic offspring, which possess a stylus to penetrate the larvae of *S. noctilio*. Female *S. noctilio* are completely sterilized by the nematode, which is spread as the wasp oviposits infected eggs into a tree. These nematodes then attack uninfected larvae of *S. noctilio*. *Deladenus siricidicola* was purchased from Australia in 1996 and released in a 90km arc around Cape Town. Logs containing larvae of *S. noctilio*, infested with the nematode, were later released at Garcia plantation, near Riversdale.

The other two biological control agents released were the wasps *Ibalia leucospoides* and *Megarhyssa nortoni*. *Ibalia leucospoides* is a parasitoid of the egg or early larval instar of *S. noctilio*. It grows within the developing egg and larva of *S. noctilio*, eventually killing the larva. *Megarhyssa nortoni* is a parasite of the final instar larva, which it paralyses before ovipositing The parasite larvae feed as ectoparasites on the larva of *S. noctilio*. *Ibalia leucospoides* was released in the Cape Peninsula, Jonkershoek, Citrusdal and Garcia plantation, while *M. nortoni* was only introduced near Van Rhynsdorp. Limited numbers of these wasps were released.

During the survey in July 2001, logs infected with *S. noctilio* were collected from eight locations. These logs were monitored for the emergence of *Sirex* and the parasitoids. All *S. noctilio* adults and some *Ibalia leucospoides* and *M. nortoni* that emerged from the logs were dissected to inspect for the presence of the parasitic nematode. Presently, nematodes have only been found in very low numbers in two locations. These locations, SAFCOL's Cecelia plantation (near Cape Town) and Papagaaiberg (Stellenbosch) are both within a 90km radius of Cape Town. *Ibalia leucospoides* was only found at Papagaaiberg and no *M. nortoni* was found.

From these results it is evident that the biological control agents have not followed the easterly spread of *S. noctilio* as expected and also occur in very low numbers in the areas where they were initially released. Hence, *S. noctilio* is spreading along the south-east coast unhindered. The probability of *S. noctilio* entering the Eastern Cape, KwaZulu-Natal and Mpumalanga is therefore high and poses a serious threat to the industry.

Safcol has responded by imposing a moratorium on the movement of softwood timber from its western and southern Cape regions. They have also encouraged other timber growers to do the same. The question now arises: are these measures enough to curb the spread of *Sirex*?



Two new Postdoctoral fellows join the TPCP

Over the years, the TPCP has attracted a number of good quality students and researchers from Africa and the rest of the world, often as postdoctoral fellows. But what is a postdoctoral fellow and what do they mean for the TPCP? These scientists have normally just completed their PhD research and look to highly rated institutions to apply their knowledge, do high level research and gain further experience. Such postdoctoral fellows thus bring their skills, education and perspective to projects of the TPCP, but also gain in all these elements from our program.

Two postdoctoral fellows have joined the TPCP in 2002. For the next two years, dr. Solomon Gebeyehu will work on the distribution, damage, identification (morphological and molecular) and control of *Pissodes* pine weevils. Solomon is well qualified for this research. He has recently completed a PhD in entomology at the University of Natal under the guidance of the well-known (NRF A-rated) Prof. Michael Samways. Solomon comes from the Shoa province in Ethiopia where he completed his schooling and graduate education at the Alemaya University of Agriculture. Here his career path turned to entomology when he joined the graduate school and completed a MSc in entomology. Due to his success and quality as researcher, he also served as lecturer during and after this time, and had the opportunity to travel abroad and study at the International Institute for Entomology and Natural History Museum in England.

The second postdoctoral fellow currently working in FABI is Dr Dilzara Aghayeva. Dilzara comes from Azerbaijan where she is a senior researcher in the Department of Lower Plant Systematics in the Institute of Botany at the Azerbaijan National Academy of Sciences. Dilzara, who was born in Kuba, Azerbaijan, completed her undergraduate studies and PhD at Baku State University. The focus of her PhD was on the biology of fungal agents involved in the vascular mycoses of oak, elm and chestnut trees. Many of the fungi involved in vascular mycoses are ophiostomatoid species associated with insects such as bark beetles. During her stay in South Africa she will, therefore, collaborate with FABI team members working on *Ophiostoma* spp. associated with bark beetles and bluestain.

We are fortunate to have two such outstanding scientists joining the TPCP and sharing their skills and experience. We wish them all the best with their work.

The following people have recently graduated in a field related to plantation tree health – Congratulations

Jacqueline Doyle - M.Sc.: Determining gene flow, linkage and parental contribution in *Pinus elliotii* X *Pinus caribaea* pine hybrids.

Ntsane Moleleki – Ph.d: RNA viruses of *Sphaeropsis sapinea* and *Diaporthe ambigua* and their possible use as a biological control agent.

Henriette Britz van Heerden – Ph.d.: Taxonomy and population genetics of *Fusarium subglutinans sensu lato* on pine and mango.

Lorenzo Lombard – Hons.:A survey of *Cylindrocladium* on *Eucalyptus* cuttings in South Africa

Gerda Vermeulen – Hons.:A taxonomic evaluation of *Botryosphaeria* spp. from *Acacia* and *Eucalyptus* spp. in Australia.

The Diagnostic Clinic 2001

During 2001 the diagnostic clinic dealt with a large number of samples. From January to December 2001 the clinic received a total of 271 samples. This is slightly less than the 335 samples received in 2000. The majority of samples were received in March and August (Figure 1). The most samples were received from pine (66.4%) followed by eucalypts (22.1%) (Figure 2). Fewer samples were received from wattle (4.6%). A number of water, growth media, seed samples and samples from indigenous trees (6.9%) were also tested for the presence of pathogens.

Figure 1
NUMBER OF SAMPLES RECEIVED - JAN TO DEC 2001

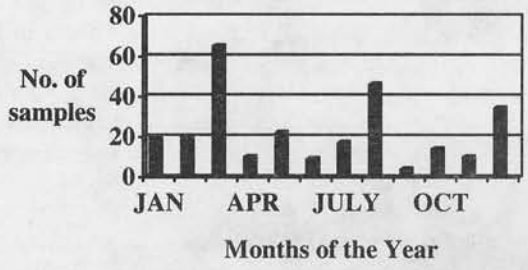
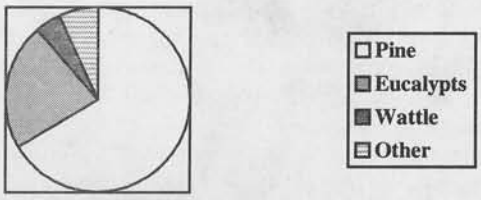


Figure 2
NUMBER OF SAMPLES RECEIVED FROM DIFFERENT HOSTS



13th Biennial Plant Pathology Conference

Albé van der Merwe was one of the fortunate FABIans to attend the 13th Biennial conference of the Australasian Society for Plant Pathology in 2001. The conference took place in the idyllic setting of Cairns, Australia at the Cairns Convention Center from 24 to 27 September 2001, and was organized by the Australasian Plant Pathology Society (http://www.australasianplantpathologysociety.org.au). Many internationally renowned plant pathologists and molecular biologists attended, giving him the opportunity to interact with them on a one-on-one basis. He says "This interaction has ultimately lead to a vast improvement on the strategy I am now taking to tackle population related questions in *Cryphonectria cubensis*".

Albé said that one of the most interesting talks was on xenia in chestnut trees, by Wadia and colleagues. *Phomopsis castanea* is a fungus that infects and rots the nuts of chestnut trees, but does not produce spores in nature. The fungus is also present as an endophyte, and both healthy and resistant tissue can be infected. However, when a *Castanea crenata* tree is artificially pollinated using pollen from the K56 variety, all the nuts resulting from the pollination are disease and fungus free. The conclusion is that K56 pollen possesses an attribute that prevents the fungus from infecting, and this effect is termed 'xenia'.

The greater TPCP group contributed to a total of four oral presentations and three poster presentations at this meeting. All of these were accepted with great enthusiasm, and helped to promote the TPCP as one of the leading research groups in plant pathology.

3rd International Bacterial Wilt symposium (IBWS)

Report

South Africa, more specifically the ARC-Industrial Crops Division in Rustenburg, hosted the 3rd IBWS in White River from the 4th to the 8th of February 2002. One hundred and ten delegates from all over the world attended the symposium. The interaction, which began on Sunday with a workshop attended by African and American scientists to initiate collaborative projects, was amazing. Researchers presenting at the symposium included many famous specialists on bacterial wilt. These included Chris Hayward, Andre Trigalet, Tim Denny, Christian Boucher to name just a few. The highlights included a presentation by Christian Boucher, the research leader, involved in sequencing the complete genome of *Ralstonia solanacearum* (recently published in Nature), a presentation by Mark Fegan on the *R. solanacearum* species complex and lastly a presentation by Tim Denny on twitching motility, adherence, natural transformation and virulence of *R. solanacearum*. These were just three of the 42 excellent oral presentations given at the symposium. Neil Theron and Nico Mienie illustrated South African's success with the certification of potato seed that prevents the spread of this economically important pathogen in propagation material. The TPCP's poster on Bacterial wilt on eucalypts in Africa resulted in some interesting discussion. The disease now occurs on this host in a number of countries in Asia and is resulting in serious damage.

Abstract

Bacterial wilt of Eucalypts in Africa.

The demand for wood to manufacture paper, viscose, rayon, construction timber and fuel is increasing in many developing countries of the world. Plantations of *Eucalyptus* thus form an important component of the economies of these countries. It is estimated that there are approximately 10 million hectares of forestry plantations worldwide.

A number of fungal diseases cause severe damage to *Eucalyptus*. These include Cryphonectria canker, Botryosphaeria canker, Cylindrocladium leaf blight and Mycosphaerella leaf blotch. Thus far, only three bacterial diseases are known on this tree. These are bacterial wilt caused by *Ralstonia solanacearum*, bacterial die-back caused by *Xanthomonas eucalypti* and bacterial die-back and leaf blight caused by *Pantoea ananatis*. The latter two pathogens have been found only in Australia and South Africa, respectively.

Surveys were undertaken in *Eucalyptus*-growing areas of South Africa, the Republic of Congo and Uganda to determine the causes of diseases that, in many cases, had resulted in tree death. One of the common diseases identified on trees less than 2-years-old was bacterial wilt. Identification was initially based purely on symptom expression and the appearance of bacterial exudates from the cut stem surfaces. Symptoms included wilting, leaf drop, death of stems, reduced growth and discolouration of the wood. Isolations and subsequent phenotypic and genotypic tests were performed on the isolates obtained and *R. solanacearum* was confirmed as the causal agent.

In South Africa, bacterial wilt occurred on a *E. grandis x E. camadulensis* hybrid in a limited area of KwaZulu/Natal. In the Republic of Congo, the disease was found in two plantations (Kissoko and Livuiti) of the hybrids *E. grandis x E. urophylla* and *E. urophylla x U. pellita* as well as on hedges in a nursery. In Uganda, the disease is common in warmer areas around Entebbe and Kampala and appears to be the most important disease of *Eucalyptus* in those areas.

Eucalyptus spp. and clones differing in susceptibility to *R. solanacearum* has been reported previously. Planting trees tolerant or resistant to this pathogen is the only practical means of controlling the disease in plantations in Africa. Breeding and selection as well as increased knowledge of the biology and epidemiology of *R. solanacearum* is crucially important and deserves further attention.

SOME ABSTRACTS FROM THE CONGRESS OF THE SOUTHERN AFRICAN SOCIETY OF PLANT PATHOLOGY - JANUARY 2002

Armillaria root rot in Ethiopia

Armillaria root rot is a well-known disease on a wide range of plants worldwide. In Ethiopia, the disease has previously been reported on *Pinus* spp. and *Coffea arabica*. The causal agent of the disease in this country has been attributed to *A. mellea*, a species now known to represent a complex of many different taxa. The aim of this study was, therefore, to determine the identity of the *Armillaria* species causing root-rot in Ethiopia. This was based on the morphology of basidiocarps and DNA sequence data. Samples were collected in plantations at and around Munessa Shashemen, Wondo Genet, Jima, Mizan and Bedele as part of a survey of plantation diseases during April 2000 and September 2001, in South and Southwest Ethiopia. Basidiocarps were collected and their morphology characterised based on published descriptions. Identification based on basidiocarp morphology was confirmed by sequencing the IGS-1 (intergenic spacer region one) of the ribosomal rRNA operon and comparing data with known sequences from different *Armillaria* spp. Samples were collected from *Acacia abyssinica*, *Pinus patula*, *Cedrela odorata* and *Cordia alliodora* trees. In addition, light brown rhizomorphs were found on *C. alliodora* and sporocarps of an *Armillaria* sp. resembling *A. fuscipes* were found on stumps of the native *Juniperus exelsa (procera)*. Sequence data confirmed that the predominant species in Ethiopia is *A. fuscipes*. *A fuscipies* is found in Southern Africa and Asia (Sri Lanka) and this study provides the first report of the fungus in Northern Africa. Another recent study has also suggested that *A. mellea sensu stricto* occurs on hardwoods in the Jima area of Ethiopia. The existence of more than one *Armillaria* species in Ethiopia is thus possible and will be investigated in more details.

Population diversity of *Ceratocystis albofundus* in Uganda

Ceratocystis albofundus is an important pathogen of *Acacia mearnsii* and *A. decurrens* in South Africa, causing stem cankers, dieback and death. In 1999, *C. albofundus* was reported for the first time in South Western Uganda, where it is commonly associated with stem wounds of *A. mearnsii* resulting from the harvesting of the stems for use in construction and for firewood. It has been hypothesized that *C. albofundus* is native to S. Africa. This is based on its occurrence on native *Protea* species and high gene diversity values obtained using the (CAT)5 oligonucleotide marker and more recently, by using 8 microsatellite markers. The aim of this study was to determine the gene diversity of a Ugandan population of *C. albofundus* and to compare it to the results obtained in a previous study on a South African population. Isolates were collected from 21 *A. mearnsii* stumps occurring in jungle stands in the South West of Uganda. All trees showed typical disease symptoms. Eight microsatellite primer pairs, previously used on a South African *C. albofundus* population, were used to amplify the microsatellite rich regions of the genome. Genescan analysis of the PCR amplicons revealed 7 of the loci to be polymorphic and one monomorphic. A total of 21 alleles across the 8 loci were obtained for the Ugandan population. Gene diversity calculations using Nei's formula showed that the South African population is slightly more diverse than the Ugandan population with a gene diversity of 0.4320 compared to 0.4082. The results further revealed that there were no common alleles within 2 of the 8 loci tested. The high gene diversity value obtained in this study indicates that *C. albofundus* may be native to Africa and not only South Africa as previously hypothesized. Future work with a larger population from Uganda will provide more information on this important pathogen and its relation to the South African population.

A survey of *Cylindrocladium* on *Eucalyptus* cuttings in South Africa

Cylindrocladium pauciramosum is a member of the *Cy. candelabrum* species complex and has a *Calonectria pauciramosa* teleomorph. This pathogen has been reported from Australia, Brazil, Colombia, Mexico, Italy and South Africa on a wide range of hosts including *Eucalyptus* species. Previous reports indicated that *Cy. pauciramosum* has been associated with plant diseases as either *Cy. scoparium or Cy. candelabrum*. Severe losses occur in forestry nurseries in South Africa due to this pathogen, where it is responsible for stem rot of cuttings prior to root formation and stem cankers after rooting. Other *Cylindrocladium* spp. previously reported from nurseries include *Cy. quinqueseptatum, Cy. curvatum, Cy. scoparium* and *Cy. ilicicola*. These species have all been reported from the stems and leaves of seedlings. In this study, a survey was conducted in four of the most important forestry nurseries that produce *Eucalyptus* cuttings in South Africa. These nurseries are located in central and northern KwaZulu-Natal. Fifty cuttings were collected from five different clones from each nursery. The cuttings were immediately examined and placed in moisture chambers. *Cylindrocladium* isolates were collected from the cuttings and identified as *Cy. pauciramosum* based on morphological characteristics including conidium, vesicle and phialide morphology as well as growth in culture. Identification was confirmed using sequence data comparisons based on the ß-tubulin gene. From the survey it was evident that *Cy. pauciramosum* is the predominant *Cylindrocladium* species occuring on *Eucalyptus* cuttings. To validate pathogenicity of the *Cy. pauciramosum* isolates collected, a trial was conducted using three months old plants representing four commercial clones. The plants were inoculated with a *Cy. pauciramosum* spore

suspension (2,2 x 10^4 conidia/ml) and evaluated for symptoms, every second day for three weeks for disease incidence. Evaluation was done with a scale from 0 (no infection) to 3 (severe infection). This showed that the pathogen is highly virulent on all clones tested. Future tests will include larger number of plants in the hope of identifying disease tolerant plants.

Mycosphaerella species causing leaf blotch disease on *Eucalyptus* in South Africa

The planting of *Eucalyptus* species as a commercial timber resource is increasing worldwide. Fungal pathogens that damage *Eucalyptus* spp. in plantations are thus becoming increasingly important. *Mycosphaerella* spp. are amongst the most serious leaf pathogens of *Eucalyptus* spp. Twenty-eight species of *Mycosphaerella* are known to cause Mycosphaerella Leaf Blotch (MLB) on *Eucalyptus*. The disease is particularly important during the juvenile growth phase where infection results in defoliation and in severe cases, death of infected trees. The taxonomy of this group of fungi is complex and challenging because many species cause similar symptoms and they are also morphologically similar. Recently, however, ascospore germination patterns and DNA sequence data have been useful in identifying species and relationships within *Mycosphaerella*. The aims of this study were to determine which species cause MLB on *Eucalyptus* spp. in South Africa and, to identify the dominant pathogen. Surveys of diseased *Eucalyptus* plantations were conducted in Pietermaritzburg, Tzaneen and Umtata and infected leaf material was collected. Using ascospore germination patterns and sequence data from the Internal Transcribed Spacer (ITS) region of the rDNA operon, we were able to show that six *Mycosphaerella* species contribute to the development of MLB in South Africa. One of these species, *M. nubilosa*, appears to be dominant, specifically on *E. nitens*. A new species of *Mycosphaerella* was also identified from leaves of *E. grandis* in Tzaneen.

Understanding and managing Pine weevils in South Africa

Pine weevils of the genus *Pissodes* (Coleoptera: Curculionidae) are naturally distributed throughout North America, Europe, and Northern Asia, and contains 55-60 species, some of which are undescribed. Their occurrence in South Africa was first reported from the Southern Cape in 1942. Currently members of this genus occur in the forestry regions of the Cape, Mpumalanga and Kwa-Zulu Natal. The adult *Pissodes* is a typical snout beetle about 7 mm long, reddish brown with two large creamy-white spots on the elytra. These species infect and kill the terminal leaders, resulting in growth loss and crooking or branching of the trunk. Indirectly, *Pissodes* weevils are suspected of infecting trees with fungal pathogens while feeding on the terminal shoots. This relationship has not been well investigated, and the extent to which this occurs in South Africa is unknown. If *Pissodes*-transmitted fungal diseases are widespread the economic importance of this pest may be greater than is thought at present.

Although most of the work that has been done on *Pissodes* in South Africa is mainly in the Western Cape, recent reports have shown the occurrence of, and notable damage by, *Pissodes* in Safcol's young pine plantations in the Sabie and Zululand regions. Currently, research is underway by a postdoctoral research fellow at FABI (Solomon Gebeyehu) to study aspects of *Pissodes*, including surveys to understand their distribution and species composition using techniques ranging from morphological to molecular attributes. Work is also underway to investigate the interaction between *Pissodes* and the pitch canker fungus *Fusarium circinatum* in the field as well as in the green house using experimental procedures. The relative susceptibility of the major pine species grown in South Africa is also being explored in an attempt to find sources of resistance for future management strategies that aim to keep *Pissodes* below economically damaging levels.

In their natural distribution, populations of *Pissodes* are regulated by several parasites and predators, but none of these have been introduced into South Africa as yet. This represents a promising area of future research. Integrated Pest Management (IPM) has become increasingly desirable based on the fact that pest management specialists have realized that relying on simplistic approaches based on a single control method have been generally ineffective and can lead to problems. For example, excessive dependence on chemical pesticides has often induced pesticide resistance in numerous agricultural pests. Similarly, exclusive large-scale use of insect resistant genotypes could increase evolutionary processes on insects resulting in the evolution of biotypes with the ability to overcome plant resistance mechanisms. IPM circumvents these problems by adopting a multi-pronged approach based on an understanding of pest-host interaction to reduce selection pressure on the pest. Accordingly, the Forest Entomology Support Programme team at FABI seeks to study this pest and develop ecologically sustainable ways of managing *Pissodes*.

bugs ... by gum

***Denis Hocking** finds that it is more a case of bio-frustration than bio-control when it comes to looking at the proliferation of eucalypt pests.*

One of the recognised risks for Eucalypt growers is the ongoing problem of bugs arriving from Australia to dine voraciously, even it selectively, on our trees.

The eucalypts almost certainly have the most complex entomology of any group of trees in New Zealand even though we don't (yet) have the full complement of Australian bugs. Myriads of insects of varying specificity and appetite support a couple of tiers of parasites and hyper-parasites, also of varying specificity and effectiveness. It's entomology with attitude and it has had us on the back foot for some time.

More than half a dozen new eucalypt pests have been reported in the 1990's and only one, the gum leaf skeletoniser, *Utaba lugens*, which arrived in Mount Maunganui was turned back. All the others have established.

One established the big hop for euc growers is bio-control, the introduction of a specific parasite. There have been a couple of notable successes with this approach and the leaf beetle (*Paropsisa charybdis*) and leaf blister sawfly (*Phylacteophaga froggatti*) are under effective control over most of the country. At best it works well, but there are no guarantees.

However, these victories belong to an earlier era and today it is more a case of bio-frustration rather than bio-control in the area of eucalypt pests. Two serious pests of the Eastern Blue Gums – the gall wasp, *Ophelimus* sp. and brown lace lerp, *Cardiaspina fiscella* – have become firmly established during the 90's. Together they threaten the survival of the common timber and amenity species *Eucalyptus botryoides* and *E. saligna* along with some other less common species. Another preferred timber species *E. pilularis* has been hit by the leaf miner *Arocercops laciniella*.

On the brighter side it might be noted that the top timber group the stringy bark eucalypts, are still free of significant pests and there appear to be fewer threats for this group lurking "over the ditch".

There are a number of frustration factors in this story including:-

- If higher priority had been given to controlling eucalypt pests, *Cardiaspina*, the most serious of recent pests, could have been stopped at Auckland Airport.
- For both *Ophelimus* and *Cardiaspina*, possible parasites have been identified and for the want of about $100.000 to $200.000 in each case, the final bio-security testing and introduction could be completed.
- The funding for the *Cardiaspina* word probably would have proceeded if FORST had not asked the wrong forestry people the wrong question. It's hardly surprising if mainstream radiata pine interests don't consider *Cardiaspina* a threat to their interests.
- *Eucalyptus saligna* and *E. botryoides* represent a significant and partly grown, timber resource. Although not the easiest of species to process they are, in my opinion, probably the most attractive of the eucalypt timbers and losing semi-mature trees to firewood would see a tragedy.
- These species are also a significant part of our urban and rural landscape.

If these are some of the frustrations relating more specifically to *Cardiaspina* and *Ophelimus*, there are also other generic problems. Things have changed in the last couple of years with the arrival of the Hazardous Substances and New Organisms Act and ERMA. Set up with the best of intentions ERMA seems to have become another leaden-footed bureaucracy – slow, pedantic and alarmingly expensive. (The bureaucracy that charges $500 to clear a $50 packet of seed). To be fair, we also have a broader political environment veering towards paranoia judging from experiences with RCD and the bunny plague.

Another problem is the transition between repelling e.g. tussock and painted apple moths, which is a MAF responsibility, and controlling the established pests which is seen as an industry problem. Yet the difference may be just a tardy response by MAT as in the case of *Cardiaspina*.

And it is not as if we lack the expertise and facilities for bio-control. At least four CRI's and some of the universities can do the work and indeed quite a bit of work is going on, mainly on wed control.

Meanwhile, the bugs continue to munch on eucalypts and also on acacias and willows and some other groups, the growers chew their fingernails, the scientist champ at the bit and the bureaucrats appear to slobber on the intricacies. Official circles don't seem to take the eucalypts seriously with the bulk of the forestry spending still continuing to support the radiata pine hegemony. Unfortunately very few eucalypt growers have products to sell yet and raising funds from them is equally difficult.

However, if we are going to get serious perhaps it is time to spend a bit on bio-security rather than establishment and silviculture. It may be time to put in the plug, rather than turning on the tap.

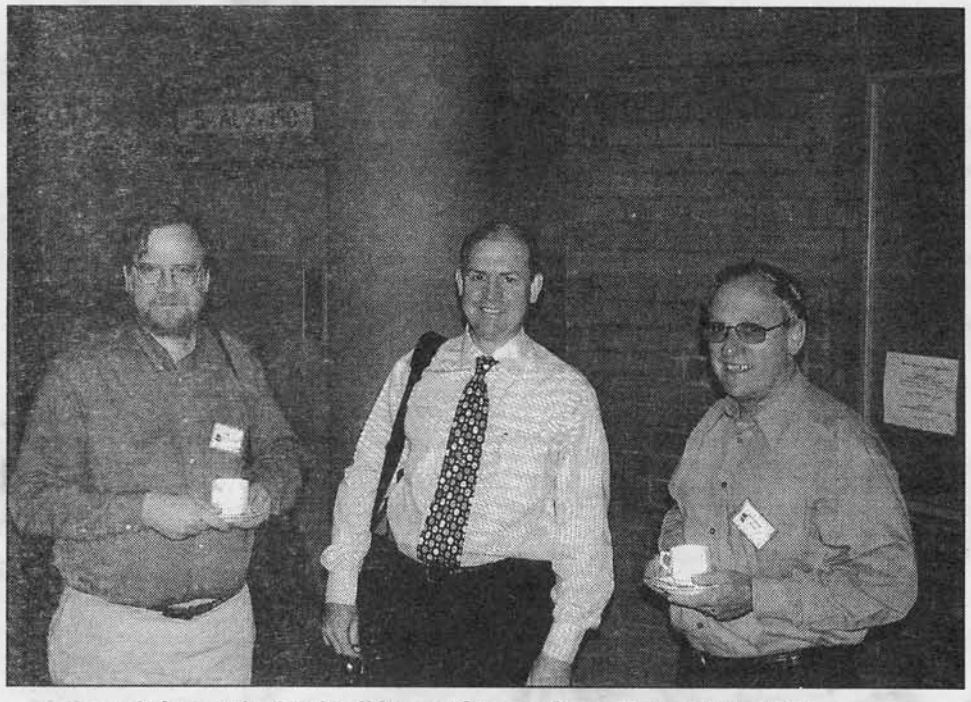
Article extracted from New Zealand Forest Industries Newsletter:
Page 32 NZ FOREST INDUSTRIES DECEMBER 1999

The 12th Annual Meeting of the Tree Pathology Co-operative Programmme

Another successful TPCP gathering

Industry and academia gathered on the 5th and 6th March in Pretoria for the twelfth annual meeting of the Tree Pathology Co-operative Programme (TPCP). This years meeting once again provided the opportunity for communication between students from the program and members of the industry on both scientific and social levels. The meeting was characterised by excellent and informative presentations by students and staff encompassing the work of the programme and focusing on the major pathogens and pests threatening South African forestry. The meeting also provided the opportunity to welcome two new members namely Hans Merensky and Global Forest Products (GFP) to the TPCP.

The procession was started with a welcome note by Prof. Mike Wingfield followed with a talk by Prof. Robin Crewe, dean of the faculty of Natural and Agricultural Sciences. This talk, focusing on changes in technical and research systems, laid a solid basis for the rest of the proceedings with emphasis on the increasing role of biotechnology in future research.



From left to right Prof Jeff Stone (Oregon State University), Mike Wingfield and Bruce Hulette (Mondi) at the TPCP annual meeting

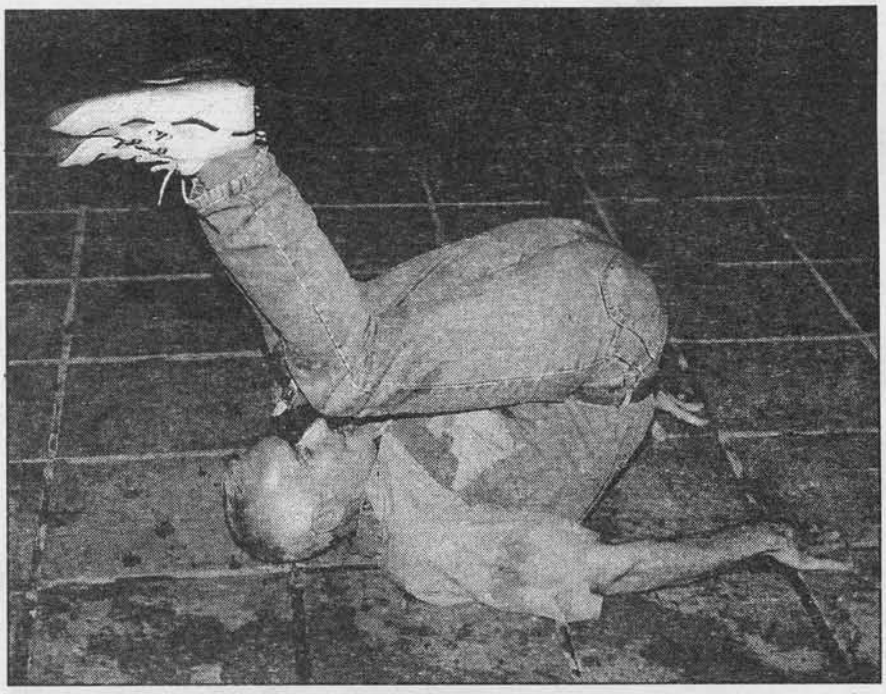
Industrial participation played a more prominent role than previous years with numerous presentations from members of TPCP member companies. We enjoyed an outstanding introductory and visionary perspective from Mr. Kevin Cazalet, General Manager of Mondi Forests. Prof. Jeff Stone, a special friend and colleague from Oregon State University, shared with us some of his forest pathology experiences, using the serious Swiss Needle Cast of Douglas Fir as an example. Dr. Zander Myburg, freshly back from his Ph.D. studies at North Carolina State University, presented an excellent vista on the molecular genetics of forest trees; Prof. Colin Dyer, Director of the ICFR shared with us his views on the link between silviculture and diseases; Dr. Bernard Janse, Director of Forest Research for Mondi outlined the research structures of Mondi Forests and highlighted links to the TPCP; Heinz Kotze of SAFCOL informed us of some of his work, over many years, on disease monitoring of PSP's and Noel Myburg of GFP presented an update on the past year's activities of the Fusarium canker Working group.

Forest entomology featured for the second consecutive year with the first presentation being an update on the growing forest entomology programme within the TPCP. Other entomological presentations included talks on the threat of the *Sirex* wood wasp of Pines, *Gonipterus* snout beetle problems and the taxonomy of white grubs in South Africa. We were also introduced to a pest not yet in South Africa, the pine tip moth. Here, we saw a wonderful example of how biocontrol and timely action can minimize the impact of a newly introduced pest.

Pathological presentations included talks on most of the major forestry problems currently in South Africa. There was a strong focus on the *Fusarium circinatum* problem, with other talks covering the topics of *Cryphonectria cubensis*, *Mycosphaerella* spp. in South Africa, *Cylindrocladium* in nurseries, the origin of the wattle wilt pathogen, blue stain in pine timber, Botryosphaeria canker on *Eucalyptus* and more about Armillaria root rot of pines.

Communication between the students and the industry however was not only scientific, but included social aspects. Delightful lunches and a pleasant dinner at the Boston Barbecue provided the perfect atmosphere for members and students to communicate on a lighter level and to get to know each other better. Some of the attendants tried their hand, or should we say head, at drinking beer in an "abnormal" fashion with some actually succeeding (after 5-6 attempts and very slow). Very few of the industry members were successful, but fortunately there were a few candidates, who with lots of practice could provide competition for the TPCP students in future.

To summarise the twelfth annual meeting of the TPCP one should look at the wide scope covered by the speakers from all aspects of the industry and once again the world. With talks covering aspects of academia and the industry, focusing on what we know, where we were, where we should aim and what we should be aware of, one cannot find any shortcomings. With industry members leaving the meeting with new questions raised and students with new ideas and some with a different perspective one cannot help but to say that once again a successful meeting was completed. May the 13th annual meeting of the TPCP on the 11th and 12th of March 2003 be as pleasant and successful as the 12th was.



Martin O'Donovan (Sappi) trying his hand at drinking beer in an "abnormal" fashion

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 Pretoria (Prof MJ Wingfield, Director and Mondi Professor, Prof B Wingfield, Prof TA Coutinho, Dr J Roux, Dr O Preisig and Mr P Govender), Rosemary Visser, Shazia Shaik, Sonja de Beer, Elizabeth Attinger, Eva Muller and Brett Hurley, colleagues and students attached to other organizations such as the ICFR, technical assistants funded by the University or through membership fees and post graduate students who are mainly funded by the NRF. Staff from various Departments in the University obviously provide advice and support where this is required.

IMPORTANT : PLEASE READ THIS

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

POSTAL ADDRESS	STREET ADDRESS FOR DELIVERIES
Tree Pathology Co-operative Programme Att: Prof Michael J Wingfield Mondi Professor of Forest Pathology and Director of FABI Forestry and Agricultural Biotechnology Institute (FABI) University of Pretoria Pretoria 0002	FABI Lunnon Road University of Pretoria Hillcrest Pretoria

Compiled by Jolanda Roux **Design and Layout by Susan Christie**