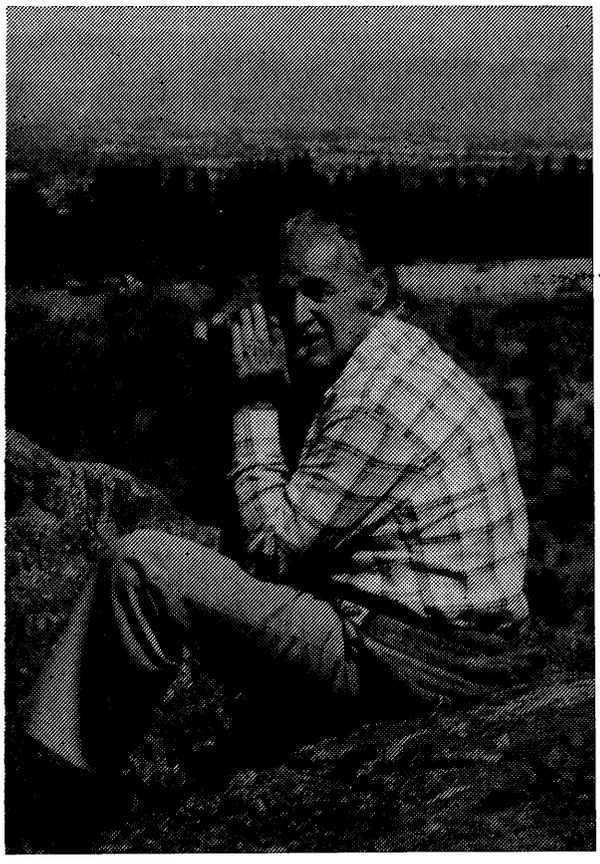
Georg Heinrich Melchior Turns 60



On 15 June, 1985 Dr. Georg Heinrich Melchior celebrated his 60th birthday. Dr. Melchior is currently the Editor-in-Chief of Silvae Genetica and the Director of the Institute of Forest Genetics and Forest Tree Breeding of the Federal Research Centre for Forestry and Forest Products. Although a plant physiologist by training, Melchior became interested in forest tree breeding in the early fifties. Before joining the Institute of Forest Genetics and Forest Tree Breeding at Großhansdorf, Melchior had worked at Wächtersbach, an out station of this Institute, and Venezuela, South America. The Venezuelan experience was particularly significant in Melchior's life. Here he found a completely different world with many problems, including those in forestry, which took a lot of his time and energy to solve. In South America, Melchior was fascinated by a non-tree species, which occurs in the tropical forest: the beautiful orchids. Since then he has spent much time in collecting and growing rare and some unknown orchids.

When Dr. Melchior took over the position of Director of the Institute of Forest Genetics and Forest Tree Breeding, he accepted a challenging job. Forestry should no longer remain a static field, but must become a dynamic field. With that motto in mind, Melchior moved on to introduce, in addition to the existing classical fields in forestry as selection and breeding (for disease resistance and yield traits), new ideas and areas that had not been integrated into forestry so far. Under his leadership, research has been initiated on genetical effects of air pollution on forest trees, breeding short-rotation forestry systems, and use of tissue culture technology for propagation and hybridization in the forest tree species. These are just a few examples of his far sight. There are many others in day to day life! But this short tribute to Dr. Melchior would be incomplete on his 60th birthday, if his efforts for the conservation of forest gene resources, particularly at a time of high mortality of forest trees due to 'Waldsterben', are not mentioned here. Since the early seventies, Melchior pointed out the necessity for conservation of forest gene resources. Because of his convictions in this area, some 3 years ago Melchior has been delegated the responsibility by the Federal Ministry of Food, Agriculture and Forestry to formulate a concept for the conservation of forest tree gene resources in the Federal Republic of Germany.

The co-editors of Silvae Genetica, the staff of this Institute, and friends all over the world wish Dr. Melchior good luck on his 60th, and much success in many scientific endeavors, planned or still in the conceptual form, including the forest gene conservation.

Hans-J. Muhs

Forest genetic material endangered by aerial pollution

The **Working Party for Forest Genetics and Forest Tree Breeding** met for a Conference on the "Problems of Damage to Forests" at the University of Göttingen, Federal Republic of Germany, from 9—11 October, 1984. After a thorough discussion, the following resolution was passed:

Our forests are endowed with a hereditary disposition which is the result of the selection carried out by both nature and man for many generations. The abundantly existing genetic variability has so far allowed the tree species to adapt to the natural as well as man-made environmental conditions. Recently, however, grave intervention by man has suddenly and drastically worsened the living conditions, as a result of which a part of the genetic variability of the forest trees has been destroyed. It is to be feared that the increase in the damage to the various tree species can result in the depletion and ultimate disappearance of gene resources in such populations, which could be considered adapted in a conventional sense. The increasing genetic loss in our forests would create difficulties especially with regard to reforestation which would be necessary in the near future.

The 1984 survey of damages to forests shows a further frightening increase as compared to the preceeding year, and that about 50% of the West German forests have already been damaged by aerial pollution. According to all prognose of the Federal and State authorities a reduction in the damage to the forests would occur not for several decades even if drastic measures to reduce environmental pollution could be put into practice immediately. The current investigations in the area of damage to the forests are more or less restricted to the control of the damage as well as the study of the causes.

The papers presented at this meeting clearly brought out the fact that it would be impossible to breed trees that would always be resistant to various (many) and complex environmental pollutants; nevertheless, forest genetics and forest tree breeding can furnish measures and techniques towards the preservation of the ecosystem of the forest. Therefore, we suggest the following:

1. Priority should be given to an immediate reduction of damage-causing pollutants so that the ecosystem of the forest can again stabilize itself.
2. A catalogue of emergency measures must be prepared to conserve present forests and to save genetic variation for future periods of lower pollution:

a) A survey should be conducted of all stands or trees which are still healthy in the polluted areas

b) A programme should be developed to locate and preserve representative samples of genetic variation

c) Research should be conducted intensively on the negative effects of pollution on the genetic material of forest trees

d) Taking into consideration the damaged forest situation, all healthy and suitable forest stands should be used for seed production

e) Measures should be taken for preservation of the present genetic information in populations of forest trees with the help from
   — Transfer of populations to less damaged areas
   — Preservation and storage of reproductive material
   — Establishment of gene banks
   — Promotion of techniques for vegetative propagation.

f) The number of tree species used in forestry should be increased in order to stabilize damaged stands (i.e. by the use of secondary species, new breeding material, exotic species).

Such measures are already partly included in the current research programmes of the member institutions of the Working Group. The completion of these programmes, which are important for the existence of forests, is only possible with an immediate and greater financial and personal support.

The Working Party for Forest Genetics and Forest Tree Breeding includes the Institutions mentioned in Silvae Genetica 33 (6) : 177 (1984).

Les Ressources Génétiques Forestières sont menacées par la Pollution Atmosphérique

Lors de la réunion du Groupe de travail de Génétique et d'Amélioration des Arbres Forestiers, du 9 au 11 octobre 1984 à l'Université de Göttingen en République Fédérale d'Allemagne, les problèmes des dommages causés aux forêts ont été discutés de manière approfondie et la recommandation suivante a été adoptée:

Nos forêts constituent un patrimoine génétique modelé par la sélection naturelle et artificielle pendant des générations. Jusqu'à présent, l'amplitude de la variabilité génétique existante a permis aux espèces d'arbres forestiers de s'adapter aux modifications du milieu, naturelles ou provoquées par l'homme. Plus récemment, les conséquences néfastes de l'activité humaine ont brutalement et dramatiquement détérioré les conditions de vie des espèces forestières et entrainé la réduction de cette diversité génétique. Il est à craindre que l'augmentation continue des dommages causés aux différentes espèces forestières entraine l'appauvrissement et finalement la disparition de ressources génétiques considérées jusqu'ici comme bien adaptées. L'appauvrissement génétique croissant de nos espèces forestières est particulièrement grave si l'on songe aux reboisements nécessaires dans le proche avenir.

L'évaluation des dépérissements de forêts en 1984, traduit une aggravation alarmante des dommages par rapport à l'année précédente, de sorte qu'à peu-près la moitié de nos forêts est atteinte par la pollution atmosphérique. Selon toutes les prévisions des autorités régionales et fédérales compétentes, la réduction des dommages dus à la pollution atmosphérique n'interviendra pas avant quelques dizaines d'années, même s'il était possible de prendre tout de suite des mesures drastiques afin de limiter les émissions de composés toxiques. La recherche actuelle se limite presque uniquement à l'enregistrement de ces dommages et à la découverte scientifique de leur cause. Les contributions des participants montraient nettement l'impossibilité de sélectionner des arbres totalement résistants aux polluants atmosphériques nombreux et complexes, bien que la génétique forestière et l'amélioration des arbres forestiers puissent contribuer à la conservation de l'écosystème "forêt." C'est pourquoi nous demandons

1. Que priorité soit accordée à la réduction immédiate des émissions de polluants, afin que l'écosystème "forêt" retrouve son équilibre.
2. Que soit élaboré un catalogue des mesures de sauvegarde afin de conserver la forêt d'aujourd'hui et de préserver sa variabilité génétique en attendant des jours meilleurs ou la pollution serait réduite.

a) Un inventaire de toutes les forêts saines et de tous les individus encore vivants dans les régions contaminées.

b) Un programme pour inventorier et conserver la variabilité génétique.

c) Des recherches approfondies sur les effets néfastes de la pollution atmosphérique sur le patrimoine génétique des arbres forestiers.

d) La possibilité de récolter des semences sur tous les peuplements forestiers d'état sanitaire satisfaisant et de qualité convenable.

e) La préservation des ressources génétiques forestières par les mesures suivantes:
— transfert des populations à conserver dans des régions moins polluées,
— mise en conservation de matériels forestiers de reproduction,
— installation de banques de gènes,
— promotion des techniques de multiplication végétative.

f) L'accroissement du nombre d'espèces utilisées en reboisement, pour stabiliser les peuplements en cours de dépérissement (espèces secondaires, variétés nouvelles, espèces exotiques).

De telles mesures font déjà partie des programmes en cours dans les Instituts membre de ce Groupe de travail. La poursuite de ces programmes, essentiels à la survie des forêts, nécessite très rapidement un soutien financier et en personnel plus important. Le Groupe de travail de Génétique forestière et d'Amélioration des Arbres forestiers comprend les institutions citées dans Silvae Genetica 33 (6): 177 (1984).

Variation in Seed Quantity and Quality in two Grafted Clones of European Larch (Larix decidua Mill.)

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Summary

Cone and seed yields were examined in two grafted clones of European larch over two years comparing interspecific and intraspecific crosses and open pollinated seed. Wide variation in yield was found within and between clones, between the two years and between interspecific and intraspecific crosses. In hybrid crosses both viability and germinative capacity were reduced compared to non-hybrid crosses.

Both total numbers of seed and seed weight were directly related to cone size. Percentage viability was not closely related to cone size although viability and seed size were moderately related. Cone weight, therefore, could be used to predict seed quantity (numbers, seed size) but not seed quality (percentage viable, germinative capacity).

The wide variation in yield suggest that both genetic and environmental variation is high in controlling seed yield.

Key words: Larix decidua, seed orchards, seed yields, hybridization, controlled pollinations.

Zusammenfassung

Bei zwei Propfklonen von Europäischer Lärche wurde die Zapfen- und Samenausbeute über einen Zweijahreszeitraum untersucht, wobei diese bei inter- und intraspezifischen Kreuzungen und frei abgeblühten Pfropflingen verglichen wurden. Innerhalb und zwischen den Klonen sowie zwischen den zwei Jahren und zwischen inter- und intraspezifischen Kreuzungen wurden große Unterschiede in der Ausbeute gefunden. Bei den Hybriden waren sowohl die Lebensfähigkeit als auch das Keimprozent gegenüber den reinen Arten reduziert.

Sowohl die Gesamtausbeute an Samen als auch das Samengewicht waren direkt mit der Zapfengröße korreliert. Das Keimprozent war mit der Zapfengröße nicht eng korreliert, obwohl Keimfähigkeit und Samengröße mäßig miteinander korreliert waren. Dagegen kann das Zapfengewicht benutzt werden, um die Samenquantität (Anzahl und Samengröße), nicht aber die Samenqualität (Keimkraft und Keimprozent) vorauszusagen.

Die große Variationsbreite bei der Ausbeute zeigt, daß sowohl genetische als auch Umweltfaktoren bei der Kontrolle der Samenausbeute eine große Rolle spielen.

Introduction

The objective of studies on the yield of seed from forest trees is to enable the better understanding of the relationship and factors affecting yields and to enable evaluation of the various clones available for seed production. An understanding of the relationship between the cone size and seed quantity and quality will assist the seed orchard manager in increasing yields through improved techniques. It is then possible to assess the reproductive fitness of different clones to assist in the roguing of the orchard. In most situations these data are missing or incompletely understood (Andersson 1965).

Data on individual clones are needed over time to ensure efficient management. In hybrid larch (*L. eurolepis* Henry) seed orchards where yields are often low but where the hybrid seed is very valuable, these data are particularly necessary.

Variation in seed yields is known to occur at several levels. At the most basic level, within-clone variation occurs in Scots pine (*Pinus sylvestris* L.) where seed weight and numbers of filled seeds varied widely between grafts (Hagmann 1972, Shen and Lindgren 1981). Significant within-clone variation has been reported, however, in seed quantity and quality in black spruce (*Picea mariana* (Mill.) (B.S.P.)) (Verheggen and Farmer 1983). Yields of seed have also been shown to vary among aspect and position within the crown (Brown 1971, Shen and Lindgren 1981). These variations in yield attributable to aspect and position in the crown did not occur in either European or Japanese larch (*L. kaempferi* (Lam.) Carr.) (Hall 1976).

Variation in seed quantity and quality between clones and between years is large and has been reported to occur in many species. Between clone variation has been reported in Norway spruce (*P. abies* L.) (Andersson 1965); Scots pine (Hagmann 1972, Shen and Lindgren 1981); lodgepole pine (*P. contorta* Dougl.) (Nilsson 1981); slash pine (*P. elliottii* Engelm.) (Squillace and Goddard 1982); balsam fir (*Abies balsamea* L.) (Powell 1979); black spruce (Verheggen and Farmer 1983) and in *Chamaecyparis* spp. L. (Yamamoto and Fukuhara 1980). This wide genetic variation partly explains why, in seed orchards, frequently most of the seed originates from a small proportion of the clones (Schmidtling 1983). If production is to be concentrated on the inherently higher yielding clones the yields of individual clones must be known. Yields are affected by environment which affects clones differentially (Andersson 1965; Ehrenberg *et al.* 1955; Squillace 1957; Nilsson 1981). The numbers of embryonic lethal genes or genetic load controls the proportion of empty seeds per cone and affects yields in Nor-

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