August Kehr—
a chromosome breeder

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I wrote a few years ago an account of Philip Savage's achievement as a Magnolia breeder for the Royal Horticultural Society's yearbook "Rhododendrons with Camellias and Magnolias" under the title "Philip Savage, Jr., a magnolia breeder with flair." I already then desired to write a similar account about August Kehr.

August and Phil are this century's giants in magnolia breeding. The work of both of them during the later part of this century will have a great impact on magnolia growing, especially in the colder areas where magnolias still can be grown, well into the 21st century.

August Kehr has devoted a life-time to plant breeding. The university for his education was Cornell, where he first studied general agriculture, agricultural education and engineering. For his doctor's degree he turned to plant breeding, pathology and cytology. From 1950-1958 he was professor in horticulture, first at Louisiana State University and then at Iowa State University. During this period he did breeding work on onion, shallot, garlic and potato.

During 1958-1978 he worked at the Vegetables and Ornamentals Research Branch, Crops Research Division, U.S. Department of Agriculture, Beltsville, Maryland. He was first Project Leader in charge of potato and sweet potato and then he became Assistant Head of the branch. During the past 13 years he was Head of the branch and was then responsible for all research programming and work on no less than 20 vegetable and 30 ornamental crops.

From 1972-1978 he was also responsible as a staff scientist for the formulation of national and regional programs in

vegetable, florist and ornamental crops.

August has over the years presented his findings in about 10 invitation papers and 30 articles. This does not include his numerous contributions to the MAGNOLIA, where he has written about his work on polyploidy and how to hybridize for late flowering cultivars. He has also in the journal described and registered his named cultivars.

It is easy to understand that August, with his vast experience of how to conduct plant breeding wit the help of all the tools that modern science offers to the plant breeder, could make a major contribution to our field of interest: the magnolias.

August, who retired in 1978 to North Carolina, was however not satisfied with one challenge. He tackled azaleas, rhododendrons and magnolias with the same enthusiasm. To be able to do what he wanted, he collected a gene pool for use as parental material. He has a collection of about 500 azaleas and rhododendron species, parental lines and hybrids. Of magnolias he has the same number of cultivars, hybrids and species.

In planning the program for his magnolia breeding, August like all breeders has had the desire to breed more beautiful magnolias of new types with new characteristics, such as new flower colors, better winter hardiness etc., but especially with later flowering and more frost-resistant expanded flowers.

The main too for achieving those aims has been the increase of chromosome numbers in parents used in crosses or in the crosses themselves. August has used colchicine treatment for this purpose. Of particular interest is his use of the "Jensen technique," which enabled him to get a direct comparison between the two ploids. It is August's opinion that polyploidy can break up the genetic bounds that exist within a non-treated plant. The polyploidy may bring better hardiness, larger flowers, later flowering or better resistance against frost damage to expanded flowers. His opinion has in some ways been proven by the Gresham and Pickard hybrids.

I myself have for some years grown two magnolia species with induced polyploidy. They are *M. kobus* 'Norman Gould'

and *M. sieboldii* 'Genesis.' The first mentioned plant was produced at Wisley in England and the second by August. Both these plants produce leaves and flower tepals which are much thicker than those of diploid forms. This seems to be quite common when polyploidy occurs. The expanded flowers of the polyploid plants have stood 4-5°F of frost when diploid ones have turned into pulp. During he past three years there has been three consecutive drought summers and I have lost nearly all my oyama magnolias but M. sieboldii 'Genesis' has flowered and fruited in a normal way, probably protected by its thicker leaves.

Of August's polyploid magnolias I find the following most interesting

1. *M. acuminata* var. *acuminata*	octoploid
2. *M. acuminata* var. *acuminata*	16-ploid
3. *M. fraseri*	(tetraploid?)
4. *M. kobus*	tetraploid
5. *M. kobus*	octoploid
6. *M. sieboldii*	triploid
7. *M. sieboldii*	tetraploid
8. *M. sieboldii*	sexaploid
9. *M. sieboldii* x polyploid *M. tripetala*	
10. *M.* Sun Ray (with increased chromosome number)	decaploid
11. *M. tripetala* x *M. hypoleuca*	polyploid
12. *M. virginiana*	tetraploid
13. *M.* 'Woodsman' x 'Forrest's Pink'	polyploid

I believe that Nos. 8, 9, 10, 11 and possibly also others will be grown for their beauty. *M. sieboldii*, sexaploid, has very large flowers. *M. sieboldii* x polyploid *M. tripetala* will have a better leaf quality than *M.* 'Charles Coates' and can probably be grown in hotter areas. *M.* 'Sun Ray' is a new, interesting yellow, and No.13 has attractive flowers. *M. acuminata* will be most interesting as a parent, originating from Phil Savage's *M. acuminata* 'Fertile Myrtle.' The same can be said for the other polyploids mentioned. The polyploids that have been named and registered will be listed further on in this article.

In addition to his work on polyploid magnolias August has

produced a further number of selections and crosses. I give below the ones I find most interesting.

1. *M. ashei* x *M. sieboldii*—Only valuable as a parent. Flowers somewhat disappointing.
2. *M. ashei* x *M. virginiana*—Not yet flowered but beautiful leaves. Should show similarity to *M.* x *Flinckii.*
3. *M. cylindrica* seedling—Large, white, open flowers.
4. *M.* 'Daybreak'—Is a hybrid between *M.* 'Woodsman' and 'Tina Durio.' Color light pink, flowering late, excellent fragrance. August considers it his best hybrid.
5. *M.* 'Encore' x *M. sprengeri* 'Diva'—Excellent pink. Will be named.
6. *M.* 'Gold Crown'—Flowers after frost, very upright growth, medium deep yellow, very hardy. August's favorite amongst yellows, is a hybrid of 'Woodsman' by 'Sundance.'
7. *M.* 'Golden Girl' (*acuminata* x *liliiflora*)—Is almost entirely yellow flowered, with just a trace of purple.
8. *M.* 'Lennei' x *M.* 'Norman Gould'—Flowers frost-tolerant. Will be named.
9. *M. macrophylla* x *M. sieboldii*—Has not yet flowered. Might become a positive surprise.
10. *M.sieboldii* x *M.(tripetala* x *hypoleuca)*—Could become a solution to problems with *M.* x 'Wieseneri' and *M.* 'Charles Coates.'
11. *M.* 'Encore', seedling of *M.* 'Ballerina'—Produces flower buds up and down the stem and multiple buds at the tips of stems.
12. *M.* 'Powder Puff', seedling of M. 'Ballerina'—Upright tepals, multi-numbered tepals.

Nos. 11 and 12 confirm the excellence of *M.* 'Ballerina' as a seed parent. Remember *M.* 'White Rose'!

August's work has resulted in many named plant cultivars in all areas in which he has worked. For the magnolia society members I will below list his cultivars in the azalea, rhododendron and magnolia genera, which have been named and released to the public.

Azaleas

White Rosebud—Double white
Anna Kehr—Double pink
Mary Lou Kehr—Fragrant light pink
Janet Flick—Double light pink, almost completely prostrate
Great Expectations—Double reddish salmon
King Red—Bright red, large flowered deciduous azalea
Terry—Huge flowered purple (a triploid)

Rhododendrons

April Pink—Fragrant, early light pink lepidote
Mountain Marriage—lndumented pink, very hardy lepidote
Southland—Floriferous dwarf, salmon elepidote
Carolina Gold—Yellow flowered, similar in growth and appearance to *R. carolinianum*
Double Gem—Deep yellow and light yellow, double flowered elepidote
Pink Magic—A deep pink dwarf, excellent foliage, lepidote
Augie Kehr—A deep yellow, double flowered elepidote

Magnolias

Sundance—A medium yellow, mid season hybrid of *M. acuminata*
Sun Ray—Developed from 'Sundance' by use of colchicine into a decaploid
Golden Girl—A hybrid of *M. acuminata* x *M. liliiflora* that is almost entirely light yellow
Daybreak—Flowers late after frost, very upright growth, neyron rose, fragrant
Powder Puff—Upright tepals, multi-numbered tepals, white loebneri
Laser—A 16-ploid acuminata, for use in hybridizing
Patriot—An octoploid acuminata, for use in hybridizing
Genesis—A tetraploid sieboldii
Encore—Produces flower buds up and down the stem and multiple buds at the tips of stems
Two Stones—A polyploid form of loebneri

I have not gone into the work on late flowering magnolias that August has carried out, but I understand that by now he has achieved his aims and should be ready to release the results of his work.

August is extremely modest in spite of all his achievements. He is generous with pollen, scions and sometimes plants, and I permit myself to recommend members who are interested in breeding to try out some of August's polyploid magnolias and then preferably as mothers. The breeding could lead to some spectacular results.

August has been honored in many ways during his life:

Selected as Chairman of the Garden Seed Conference of the American Seed Trade Association, Chicago, IL, January, 1968.

Invited to write a chapter in Volume 15 of *Encyclopedia of Plant Physiology*

Listed in Who's Who in America (lapsed when he retired in 1978). Invited again 1995.

Elected to the Cosmos Club, Washington DC, 1967

Elected Fellow of the Society for Horticultural Science, August, 1975

B.Y. Morrison Award to Contribution to Environmental Quality and Horticulture, 1982

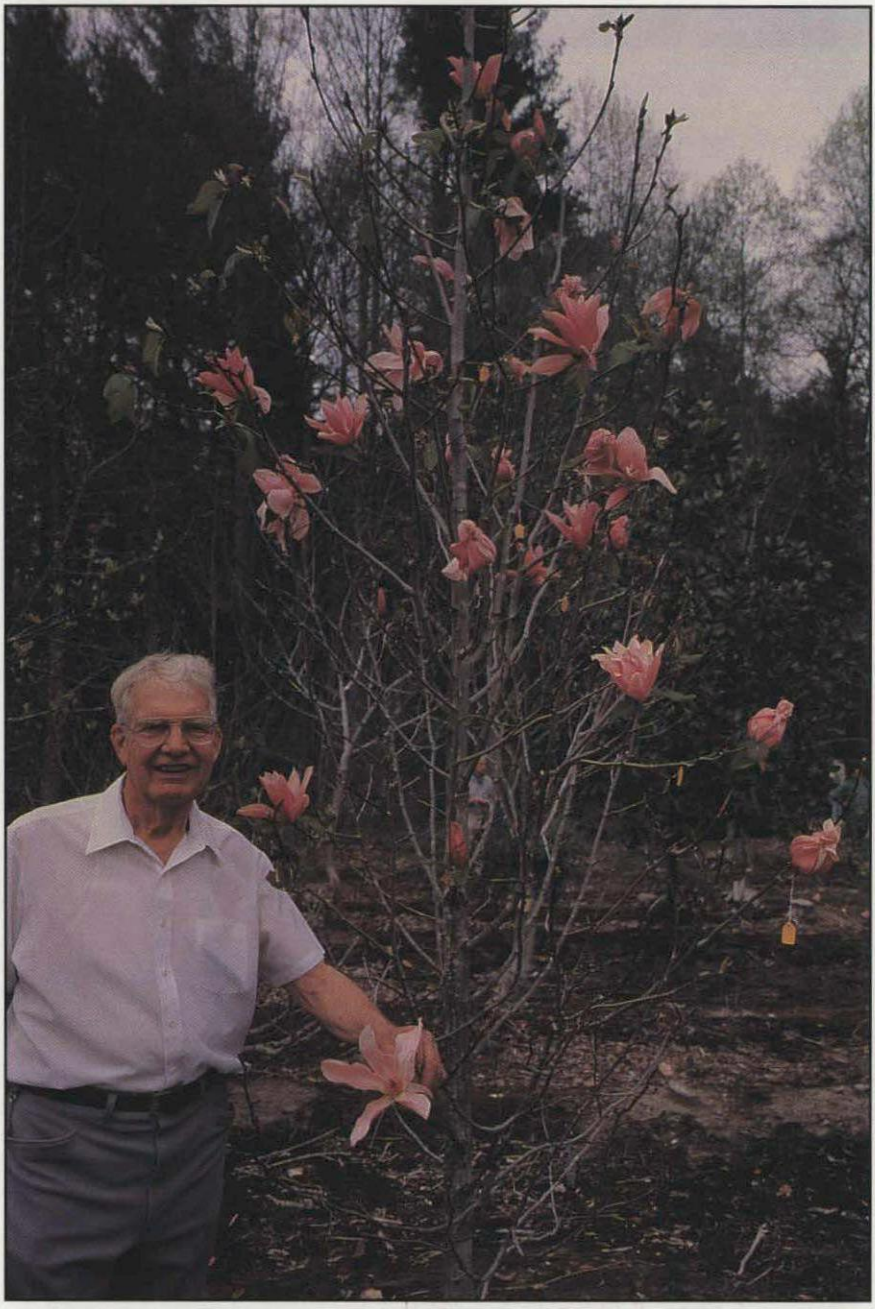
Gold Medal – American Rhododendron Society, 1976

D. Todd Gresham Award of the Magnolia Society, 1992

Pioneer Achievement Award, American Rhododendron Society, 1994

Listed in Who's Who in Science and Engineering in America, 1994

I consider it most fortunate that the Magnolia Society has such a capacity as August as its member. To have two magnolia breeding giants such as August Kehr and Phil Savage at the same time is more luck than we deserve.



Dr. August Kehr with Magnolia 'Daybreak.'