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POTOMAC BONSAI ASSOCIATION

Newsletter

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PBA

VOL 16 NO 1 JANUARY 1986

CALENDAR OF EVENTS

1 January — H A P P Y N E W Y E A R ! ! ! Sorry this is a little late but but it's still appropriate.

11 January Saturday — NORTHERN VIRGINIA (703) 938-0683: Green Springs Horticultural Center at 10:00 a.m. BONSAI POTS : Topics to be covered will be: DESIGN, MANUFACTURE, USE, CARE. Demonstration on how you can make your own pot and how to get it fired. Slides and movies will be shown on making bonsai pots in Japan. Sample pots will be on display.

23 January Thursday — BROOKSIDE (301) 871-5768: Argyle Community Center. BEGINNERS' WORKSHOP at 7:00 p.m. 7:30 p.m. JAPANESE PHILOSOPHY and HOW IT RELATES to BONSAI by Dr. Reimer, Head of the Far Eastern Division of Library of Congress. This promises to be a very interesting lecture. Remember that all PBA member club members can attend any meetings sponsored by other PBA member clubs. Special request - if you have an attractive, indoor bonsai please bring it. Argyle Community Center can be reached from the Washington Beltway by exiting at Georgia Ave., heading north, right at the first traffic light, pass the hospital, go up a rise and there it is.

For information on the following club activities telephone the numbers listed below:

ANNAPOLIS	(301) 263-3995
BALTIMORE	(301) 557-9399
BOWIE	(301) 496-5195 work , 262-9633 home
KIYOMIZU	(301) 423-8230
WASHINGTON	(202) 232-6126

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INDOOR BONSAI LIGHTING

Albeit this article may be too late for those who own indoor bonsai since tropical and sub-tropical bonsai should have been placed under cover by this time of year, but it is never too late to assess the winter lighting that your indoor plants are being ecposed to. In passing it should be noted that tropical bonsai should have been brought indoors when the outside temperatures drop to between + 18°C and + 24°C (64°F and 75°F) or below those temperatures and for subtropical bonsai,- between + 10°C and +15°C (50°F to 59°F). (The temperature values were taken from "Bonsai fur die Wohnung" (in German) by Paul Lesniewicz. It is understood that an English translation will be on the market sometine in February 1986 in both hard and soft-cover. The Northern Virginia Bonsai Society is making arrangements to be able to supply copies of the English translation at very reasonable prices.)

During the past years in the Winter months, my bonsai have been sequestered on a bench in the basement of my home under 48 - inch long fluorescent lamps. Over the past years, my bonsai never showed signs of being happy under the 48 -inch long Cool-White fluorescent tubes. Finally this year I decided to look further into the matter of what fluorescent lamps to use,- Cool-White, Warm White, Standard Gro-Lux and Gro-Lux Wide Spectrum after reading parts of "Bonsai für die Wohnung" (Bonsai for the Home).

The ideal indoor location for indoor bonsai is in a brightly lit window where the impinging light is not degraded by shadows being cast from neighboring buildings, outside trees, or an overhang to the house. Note that this does not necessarily mean that the plants should be exposed to direct sunlight. Also be careful in trying to judge light intensity using your naked eyes, since they compensate very well for a wide range of light intensities so that subconsciously you think that the light a few feet into a room is equal in intensity to that at the window ledge. The best way to check the amount of light reaching your bonsai is to use either a hand-held camera lightmeter or the one built into your or a friend's camera. Adjust the settings on the lightmeter or camera to what they would be for taking a picture in bright sun. If your camera or lightmeter shows that the f-stop reading is what you would expect under bright light, you do not have to augment the daylight with artificial light. A piece of white paper as a reflector can be held at the top of the bonsai to enable you to get a more accurate reading at that point when the camera or lightmeter are aimed in that direction. If the window location is not bright enough, then one can resort to adding artificial light until the desired intensity of light is achieved.

However as in my home, it is hard to marry a cool location with a bright, high light intensity window. To promote dormancy during the Winter months, temperatures should be maintained at the levels cited above for tropical and sub-tropical plants. This in my home is not possible since the bright window location is in part of the living quarters where daytime temperatures are not below 72°F. In addition during the daytime my wife would seriously object to my closing a curtain around the window to protect the plants from the hotter room temperature and be in cooler air made possible by the cooling effect of the outside air on the window pane. My indoor bonsai reside on a bench in the basement of my house. Since the amount of outside light available to my indoor bonsai is very limited, I use a bank of 48 inches long fluorescent tubes. According to literature on growing plants indoors, one is supposed to obtain sufficient light intensity from such tubes when spaced as close as 2 inches center to center. Using the lightmeter test, the amount of light only 4 inches from the tubes is just about equivalent to what might be expected in a brightly lit window.

But at this point the matter as to what type of lamp to use for indoor lighting is far from resolved, as on realizes when one learns that fluorescent lamps come in four varieties, - Cool-White, Warm-White, Gro-Lux, and Gro-Lux/WS (wide spectrum). By now everyone knows that incandescent lamps are not a good source of indoor lighting because for one reason, they throw off a large amount of heat compared to fluorescents. In addition the hourly cost to operate incandescent lamps compared to fluorescent lamps in order to provide the same amount of light intensity is about 3 to 1, and the fluorescent tubes operate 10 times longer before burning out. Operatin of two 40 watt Gro-Lux/WS lamps would cost about $ 1.25 per month based upon 15 hours per day operation and an electrical rate of 3 cents per kilowatt-hour. On the same basis, it would cost about $ 2.43 to operate a 96-inch long fixture with two 75 watt incandescent lamps. Cost include the enegy used by both the lamps and the ballast (power supply for the fluorescent lamps). See reference 1.

In order to better understand what is known about the uses of the four different fluorescent lamps, Mr. William Simpson, a lighting engineer with GTE Sylvania, was contacted and he very graciously met with me and I was given a number of very interesting Sylvania Engineering Bulletins. One finds in reading some of them that work is being done, the U. S. Department of Agriculture included, to make the use of artificial lighting an economically viable means for producing vegetables and fruit out-of-season, forcing flowering plants and bulbs for the floral industry, starting seedlings under less adverse conditions to insure closer to 100% survivability as well as in the rooting of cuttings. See reference 2.

Figure 1 shows the wavelengths of visible radiation which comprises the components of white light and invisible radiation such as X-rays, radio, etcetera, all of which comprise the electromagnetic spectrum. Figure 2 shows

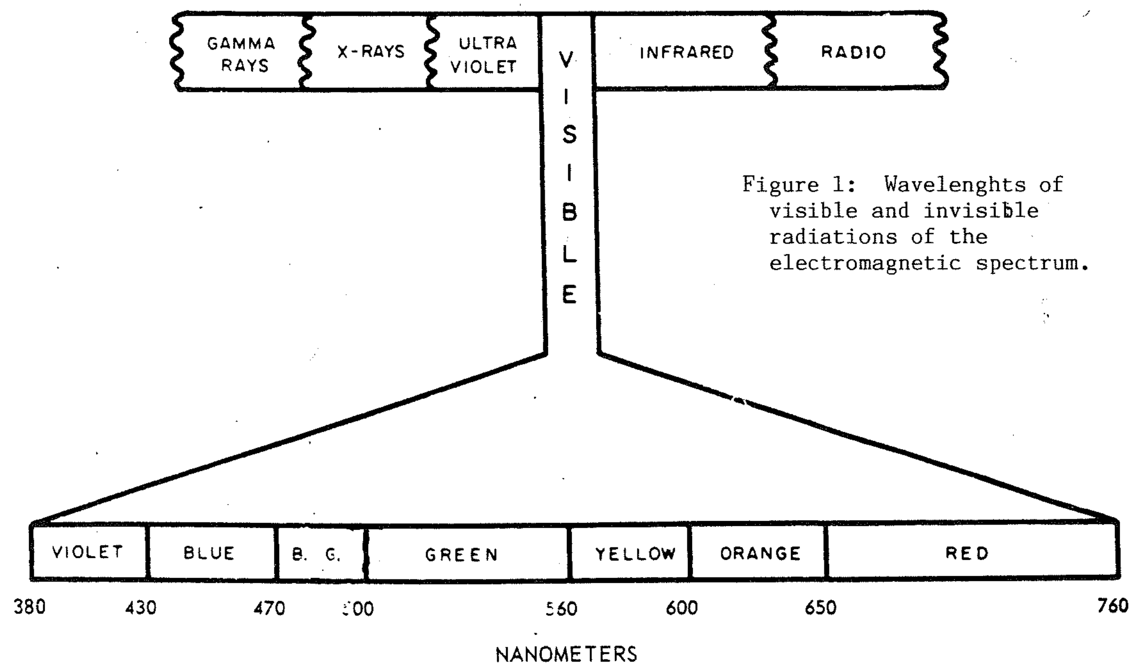
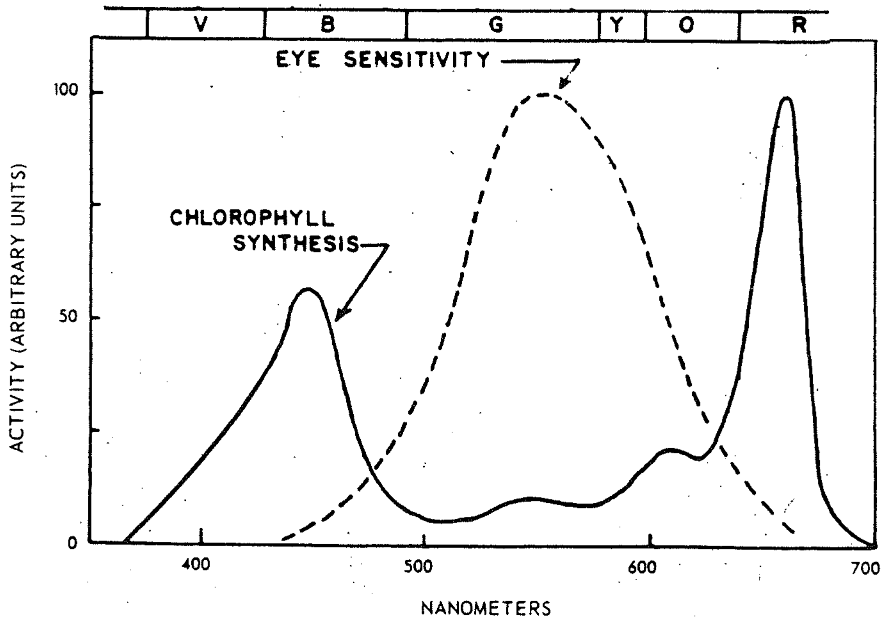


Figure 1: Wavelenghts of visible and invisible radiations of the electromagnetic spectrum.



Key:
V - violet
B - blue
G - green
Y - yellow
O - orange
R - red

Figure 2: Spectral density curves showing the disparity between the range of light that the human eye is sensitive to and the colors for which the chorophyll synthesis in plants is most responsive.

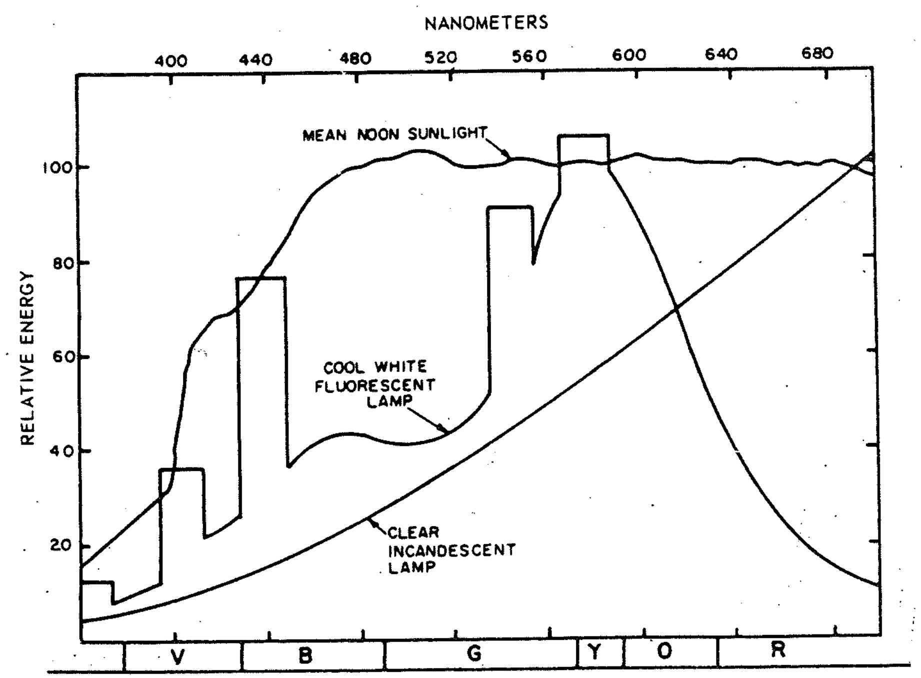


Figure 3: Spectral density curves showing how sunlight or white light provides almost equal intensities of colored light versus artificial lights.

what colors the human eye is most sensitive to. Superimposed on Figure 2 is the chlorophyll synthesis curve for plants. Note that one's eyes are least sensitive to blue, green and on the opposite end - the reds and darker reds, the ranges where the chlorophyll activity is most responsive to light. All in all the human eye is limited in its evaluation of the intensities of the different bands of color in the light from an incandescent lamp versus that from a fluorescent tube or in sunlight. Figure 3 shows just how much variation there is between sunlight, an incandescent lamp and a Cool-White fluorescent tube. Note that an incandescent bulb is almost void of any blue light but does contain a large amount of red light.

Developments in the study of light and plant growth are currently subdivided into five areas, - chlorophyll synthesis, photosynthesis, photoperiodism, phototropism, and photochrome response. Life on our planet depends on a key event, photosynthesis. This is the putting together by means of light, two simple substances - carbon dioxide and water - to form carbohydrates, the basic food for all living organisms, and release oxygen as a by-product. During the time when light is present, respiration is continuing simultaneously and some of the oxygen is utlized in that process. At night, photosynthesis stops, but the respiratory process continues. The green pigment, chlorophyll, plays a vital role in photosynthesis.

But, before photosynthesis can take place, chlorophyll must be present in plant leaves. It is constantly being synthesized by the action of light energy absorbed by a leaf constituent, photochlorophyll. The highly active or effective wavelengths in the red and blue regions of the spectrum are required for the synthesis of chlorophyll.

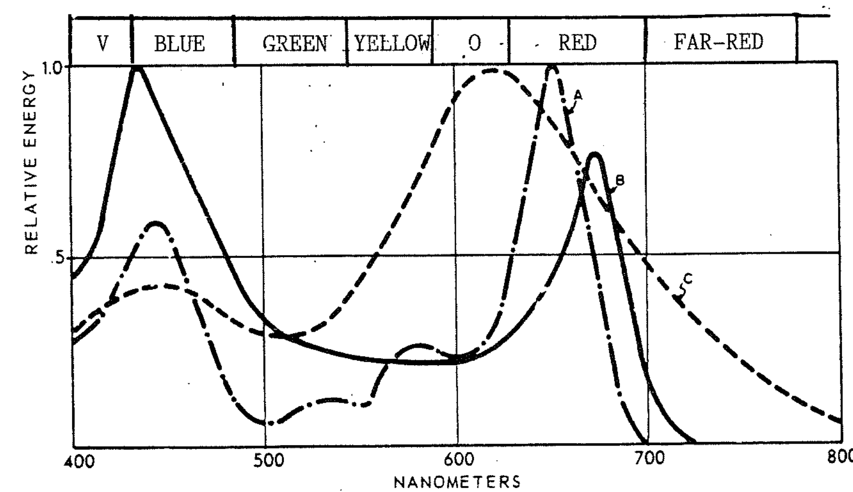


Figure 4: Comparison of the action spectra of the two principal photochemical reactions with the Gro-Lux/WS lamp.
(A) Chlorophyll Syntesis Curve
(B) Photosynthesis Curve
(c) Spectrum-Energy-Distribution Curve of the Gro-Lux/WS Fluorescent Lamp

Figure 4 compares the relative energy responses for chlorophyll synthesis and photosynthesis to different types of light and also the spectrum-energy-distribution curve for the Gro-Lux/WS fluorescent tube. The Gro-Lux/WS lamp was a later development than the Gro-Lux lamp. Their energy distribution curves are for the most part almost identical, i.e. more light energies in the blue and red ranges, but the Gro-Lux/WS lamp has more energy in the far-red range of the spectrum compared to that found in the Gro-Lux. The importance of just that added feature is covered in the section Photochrome Response almost at the end of this article. Figure 5 shows the differences in the energy distributions for the Gro-Lux/WS and the Gro-Lux lamps.

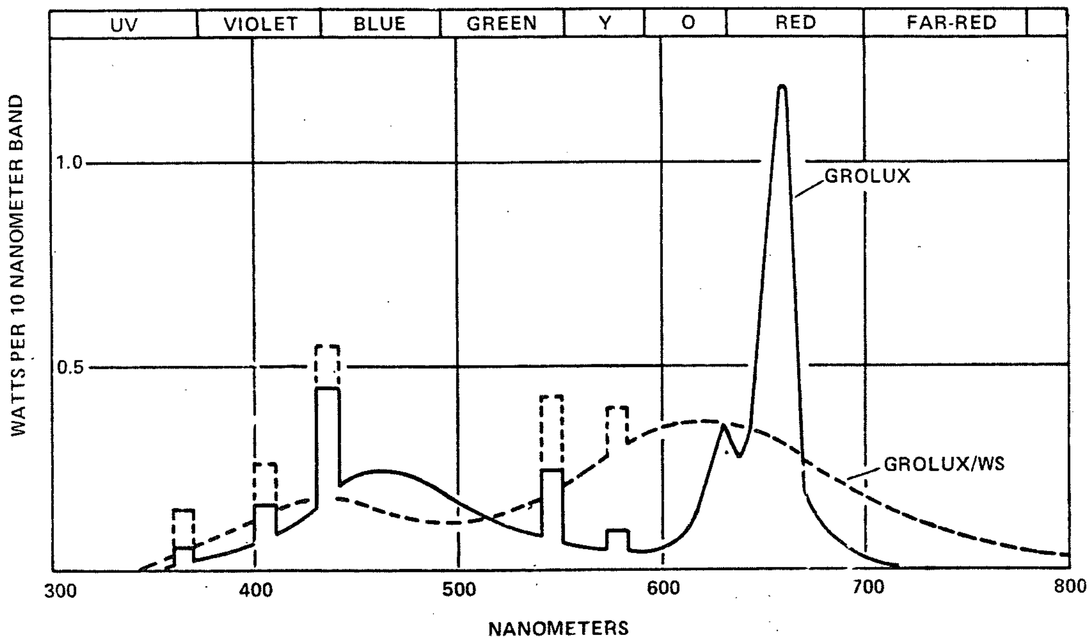


Figure 5: Comparison of the spectral distribution curves of the Standard Gro-Lux and the Gro-Lux Wide Spectrum lamps, showing the greater amount of the far-red energy from the Gro-Lux Wide Spectrum lamps.

Table 1 on the next page was taken from reference 1 and shows the differences in energy emission in the range of color bands for the following four lamps: Cool-White, Warm-White, Standard Gro-Lux, and Wide Spectrum Gro-Lux. Today, one finds that the combination of a Standard Gro-Lux lamp and a Wide Spectrum Gro-Lux are recommended as the combination that will make your plants the happiest. Those two lamps provide more energy in the blue and red/far-red color bands than do the Cool-White or Warm White fluorescents. Dr. Marc Cathey, Director of the U. S. National Arboretum and an eminent authority on the subject of growing plants under artificial lighting, was queried on this matter. His respsonse was that there would be spindly growth, wide spaces between the leaf nodes, and stressing the plant by making it use more water than it normally should. His advice was to use the combination of a Cool White and a Warm White pair of fluorescents thus giving your bonsai enough light for the Winter period of dormancy, and thereby a compact leaf structure for the bonsai can be maintained. The Gro-Lux lamps are useful if one wishes to accelerate the growth of seedlings or force flowers or fruit for sale on the commercial market.

TABLE 1
ENERGY EMISSION IN ARBITRARY COLOR BANDS
40 WATT FLUORESCENT LAMPS
In Watts and Percent of Total Emission

	BAND IN NANOMETERS	WARM WHITE		COOL WHITE		STANDARD GRO-LUX		GRO-LUX/WS	
		WATTS	PERCENT	WATTS	PERCENT	WATTS	PERCENT	WATTS	PERCENT
Ultra Violet	< 380	0.13	1.52	0.16	1.68	0.10	1.42	0.27	3.16
Violet	380-430	0.46	5.15	0.72	7.57	0.70	9.67	1.07	12.48
Blue	430-490	1.15	12.91	1.98	20.78	1.96	27.07	1.22	14.29
Green	490-560	1.80	20.24	2.35	24.67	1.02	14.02	1.24	14.49
Yellow	560-590	2.06	23.17	1.74	18.27	0.10	1.42	0.83	9.77
Orange	590-630	2.13	23.95	1.69	17.75	0.44	6.05	1.36	15.93
Red	630-700	1.03	11.53	0.81	8.47	2.86	39.55	1.86	21.78
Far-Red	700-780	0.13	1.53	0.07	0.81	0.06	0.80	0.69	8.10
TOTAL		8.89	100.00	9.52	100.00	7.24	100.00	8.54	100.00

As for my situation, I purchased Gro-Lux lamps, both the Standard and Wide Spectrum before Dr. Cathey set me straight. Now I'm playing it safe, so to speak, over my bench in the basement there are in 48 inches long fluorescent fixtures 2 Cool-White, 2 Warm-White, 2 Standard Gro-Lux, and 2 Wide Spectrum Gro-Lux lamps. The plants, so far, are showing little if any perceptible growth except for a Kingsville boxwood, and that growth isn't all that objectionable. What has me concerned is that the Kingsville may not be going through its much needed period of dormancy while the other plants are. Will have to wait and see.

To round out the subject of how light affects plants, the remaining subjects of photoperiodism, phototropism and photochrome are briefly described below.

Photoperiodism is the relationship between the lengths of the dark and light periods. According to reference 3, the period of exposure to artificial light can vary from 6 to 8 hours when the artificial light augments natural light to 10 to 16 hours if the plants receive no natural light.

Phototropism is the reaction of a plant or plant part to unequal light energy on opposite sides, - the bending of a plant toward or away from the light. This is more pronounced under artificial light since artificial light is more of a point source compared to sunlight. In addition sunlight is such that its coverage in being widespread, can be reflected back to the plant from neighboring surfaces. Mr. William Simpson, GTE Sylvania engineer, strongly recommended that the plants sit on a white table to reflect light back to the undersides of the leaves. To do the equivalent, I covered the top of the table with a layer of Perlite which besides being very white also is water absorbent which then permits me to water or spray the plants and have the Perlite absorb the residual water thereby maintaining the humidity level up to about the 40% to 50% level, see reference 3.

Photochrome response is a recent discovery by the U. S. Department of Agriculture scientists working at Beltsville. It has been shown to control seed germination, seedling growth, cell elongation, antocyanin synthesis, and photoperiodism. As such, this photochemical reaction may be the master control for plant development, because it directs the plant's progress from one step to the next. It is most responsive to red and far-red light,- hence the applicability of the Wide Spectrum Gro-Lux.

In conclusion:

1. Use a combination of Cool-White and Warm-White fluorescent tubes in equal quantities tor normal wintering of your bonsai.

2. Use a Standard Gro-Lux and a Wide Spectrum Gro-Lux where seed germination or seedling growth is desired.

3. Keep the lamps on for periods of time that may vary from as little as 6 hours a day where there is some natural light, to 10 to 16 hours when there is no outside light. Use a timer to set the time-interval and maintain it from day to day.

4.Place the top of each plant about 4 to 8 inches below the light tubes. Distances can be adjusted for the light fixture by having it on chains which can be set into hooks in the ceiling, and for the plants by raising them individually on wood blocks, bricks, or inverted flower pots.

5. Paint or cover the top of the table with something white. If Perlite is used, some Perlite can be spread over the surfaces of the soil in the pots.

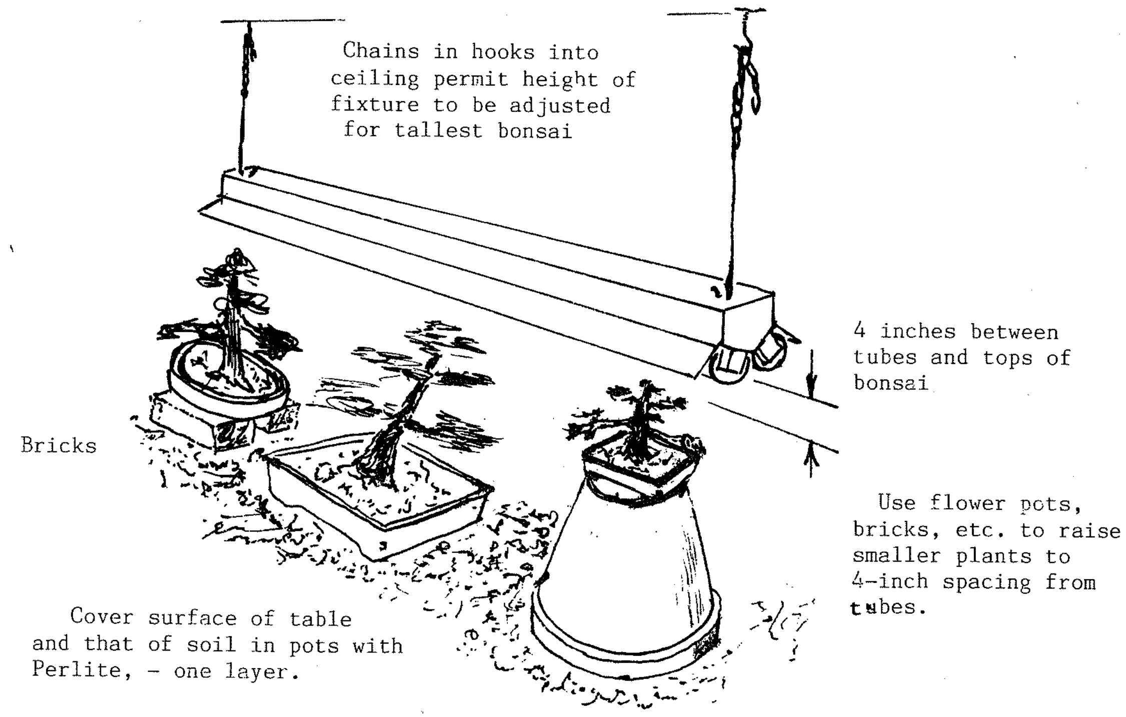
References:

1. FLUORESCENT LAMPS, GTE Sylvania Inc Engineering Bulletin 0-285
2. APPLIED LIGHTING, GTE Sylvania Inc. Engineering Bulletin 0-278
3. BONSAI für die WOHNUNG, Paul Lesniewicz, Bonsai Centrum Heidelberg, Germany, 1985

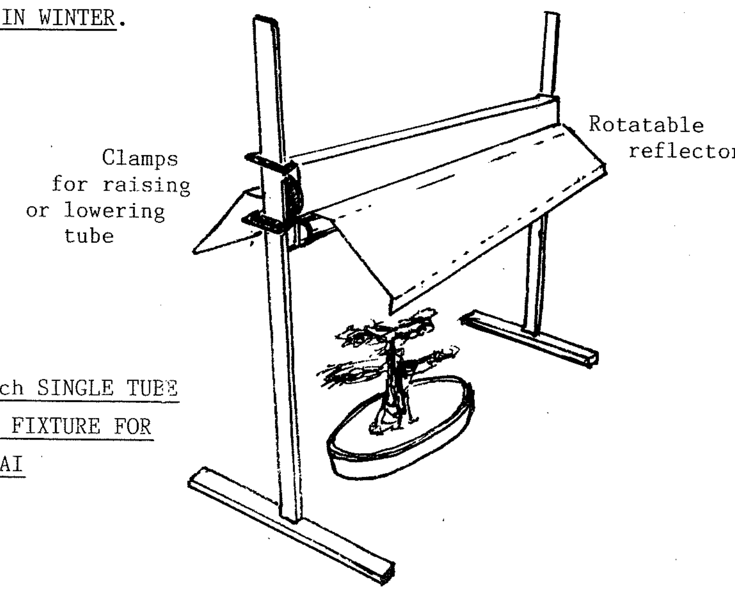
For those readers who wish to delve into the matter further in addition ot the above the following GTE Sylvania Inc. Engineering Bulletins may be of interest:

* 0-261 FLUORESCENT LAMPS: The Standard Gro-Lux Lamp, A Sylvania Source for Aquarium Lighting.
* 0-262 FLUORESCENT LAMPS: The Standard Gro-Lux Fluorescent Lamp, The Original Plant Growth Lamp for Indoor Gardening.
* 0-327 APPLIED LIGHTING: Basement Light Gardening with Gro-Lux Fluorescent Lamps.
* 0-286 APPLIED LIGHTING: Orchid Growth with the Standard Gro-Lux Fluorescent Lamp.
* 0-351 HORTICULTURAL LIGHTING: Greenhouse Supplemental Lighting for Roses with Lumalux High Pressure Sodium Lamps. (Note; these lamps are normally used in large, commercial greenhouses to force flowering or fruiting of plants.)
* 0-352 HORTICULTURAL LIGHT SOURCES: Light Sources for Horticultural Lighting . (Note: Same as for 0-351 above.)

The author is very grateful to Mr. William Simpson, GTE Sylvania engineer, for discussing the subject with the author and also providing copies of the above GTE Sylvania Engineering Bulletins.



USE OF 48-inch 2- FLUORESCENT TUBES FIXTURE FOR INDOOR BONSAI IN WINTER.



24 - inch SINGLE TUBE FLUORESCENT FIXTURE FOR INDOOR BONSAI

LIVING LEGENDS
AT THE
U.S. NATIONAL ARBORETUM

ELM TREES

This is another presentation of the notes passed out at the U.S. National Arboretum's monthly series "Living Legends", - and it's always free. The program on 3 November, 1985, addressed trees and a rather pertinent subject was one relative to elm trees and what the U.S. Arboretum is doing to try and prevent the future spread of Dutch elm disease. Of particular interest to bonsaiists is the mention that Asiatic species are the most resistant. Therefore, those little-leaf Chinese elms should continue to do just fine.

Elm trees are in the family Ulmaceae, genus Ulmus. The genus includes some of the best known and useful forest, landscape and street trees of the Northern Hemisphere. The thirty-one (31) species are scattered throughout North America, Europe and Asia:

Area Distributed	No. of Species
Eastern North America	6 species
Mexico	5 species
Europe	6 species
Eastern Asia	10 species
Himalayas - Southeast Asia	4 species
Total	31 species

The American Elm (Ulmus americana) is the most famous species. It forms a vase-shaped crown and has been the favorite shade tree in the United States before the onset of Dutch elm disease.

BOTANICAL FEATURES OF ELMS

Elm leaves are alternate, doubly toothed and often lopsided at the base. The flowers have no petals and appear before the leaves in the spring, or in some species in the autumn. The fruit contains a nutlet inside a flattened, oblong samara made up of a papery wing. The fruit ripens within two months after flowering.

DISEASE PROBLEMS

Some elms are susceptible to Verticillium, Dothiorella, wetwood and phloem necrosis, but the most serious is Dutch elm disease caused by the fungus Ceratocystis ulmi. The fungus is transmitted by elm bark beetles. Female beetles seek out dead or weakened wood and lay their eggs in galleries between the bark and the wood. Upon emergence, young adult beetles carry spores of the fungus to healthy trees.

One control is to prevent beetles from feeding and breeding. This aspect is done through chemical or sanitation techniques. The other type of control is the development of disease-resistant elms.

SPECIES VARIATION IN RESISTANCE TO DUTCH ELM DISEASE

In general, Asiatic species are the most resistant (U. pumila and U. parvifolia especially); European species are intermediate; and American species are susceptible to Dutch elm disease.

GENETIC ENHANCEMENT OF ELMS

The goal in the elm genetics program is to develop disease and insect resistant, stress tolerant clones that are marketable in the nursery trade and desired by consumers. The program involves recurrent selection and breeding. The Breeding Phase involves making controlled crosses among desirable genotypes and outplanting the progeny. The Selection Phase includes inoculation of progenies with a mixture of aggresive and non-aggressive strains of fungus. Afterwards, resistant, horticulturally desirable clones are propagated and propagules are sent out during the Evaluation Phase in selected sites throughout the United Sates.

NEW DISEASE CULTIVARS

'Urban' elm	European x Asiatic hybrid
'Pioneer' elm	European x European hybrid
'Homestead' elm	European x Asiatic hybrid
'Dynasty' elm	Chinese elm (U. parviflora) selection
"Sapporo Autumn Gold'	University of Wisconsin Asiatic hybrid

Author: Dr, Alden Townsend, Supervisory Research Geneticist
U. S. National Arboretum

BLOOMING DATES AT THE NATIONAL ARBORETUM

The following listing indicates the blooming dates for the various flora the the U. S. National Arboretum. It is suggested that you keep this somewhere so that you can follow the succession of blooming dates not only relative to those plants you may have but also with the thought in mind of visiting the Arboretum and enjoying the blooms.

January and February: Witch hazels, Conifers.

March - 2nd week: Winter hazel.

March -3rd week: Pieris japonica, winter jasmine, Japanese camellias.

March - 4th week: Pussy willows, Japanese camellias

April - 1st week: Daffodils, Crocus, Japanese camellias, early magnolias, Rhododendron mucronulatum, Pieris japonica, forsythia, wildflowers, Cornus mas.

April - 2nd week: Daffodils, Crocus, Japanese camellias, early magnolias, Rhododendron mucronulatum, Pieris japonica, forsythia, wildflowers.

April - 3rd week: Japanese camellias, daffodils, magnolias, Pieris japonica, Forsythia, tulips, Callery pear, Japanese quince, early crabapples, flowering cherries, azaleas, wildflowers.

April - 4th week: Magnolias, crabapples, violets, early azaleas, early rhododendrons, daffodils, Japanese quince, wildflowers.

April - 5th week: Early rhododendrons, azaleas, flowering dogwood, crabapples, late ornamental cherries, late camellias, Japanese quince, magnolias (Soulangiana varieties), wildflowers.

May - 1st week: Flowering dogwood, azaleas, doublefile virburnum, rhododendrons, peonies, tree peonies, wildflowers.

May - 2nd week: Late azaleas, rhododendrons, Magnolia virginiana, tulip trees, black locust, Chinese dogwood, peonies, wildflowers.

May - 3rd week: Late azaleas, rhododendrons, mountain laurel, Magnolia grandiflora, Magnolia macrophylla, peonies, Chinese dogwood.

May - 4th week: Chinese dogwood, mountain laurel, Magnolia grandiflora, Magnolia virginiana, daylilies, lilies.

June - 1st week: Magnolia grandiflora, Southern catalpa, Viburnum dentatum, lilies, daylilies, waterlilies, Chinese dogwood, Rhododendrons, Pyracantha, fringetree.

June - 2nd week: Mountain laurel, Linden viburnum, Rhododendrum maximum, Koelreuteria, daylilies.

(Continued)

OF INTEREST IN THE FOLLOWING MONTHS:

July: Waterlilies, Hibiscus, conifers, daylilies, dogwood.

August: Waterlilies, Hibiscus, conifers, crapemyrtle, Boxwood.

September: Pyracantha, waterlilies, Hibiscus, Viburnum in fruit, Colchicum, Boxwood, crapemyrtle.

October: Fall foliage, Pyracantha, Hibiscus, Camellia sasanqua, Colchicum, waterlilies, crapemyrtle, Viburnum in fruit, conifers, dogwood in fruit, Boxwood.

November: Camellia sasanqua, conifers, dogwood, Viburnum in fruit, Fall foliage, pine cones.

December: Holly in fruit, pine cones, Nandina in fruit, conifers.

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1986 NOMINEES FOR PBA OFFICES

P.B.A. Nominations for Officers for 1986-1986: The P.B.A. Nominating Committee presents the following slate for offices in 1986-1987. Elections will be held at the Annual P.B.A. Meeting on Saturday April 26th following the 1986 P.B.A. Spring Show at the National Arboretum.

Richard Meszler . . . . President
Frederick Mies . . . . First Vice President
Mike Ramina . . . . Educational Vice President
Douglas McCurdy . . . . Treasurer
Julie Walker . . . . Secretary

NOW IS THE TIME

A number of years ago, Dan Robinson and Col. John Hinds introduced me to Dr. Bert Bruenner on a vist to Seattle, Washington. He has an outstanding collection of bonsai and has been doing bonsai for many years,- beginning before many of us even gave much thought to Japan. The following advice is well worth repeating for the benefit of not only bonsai neophytes but also experienced hands. It appeared in Dr. Bruener's column "NOW IS THE TIME" in the Puget Sound Bonsai Quarterly, Vol. 12, No.4, Seattle, Washington.

"The following are only ten of the mistakes I make over and over again in the care of my bonsai:

1. Poor drainage, a major cause of root rot.
2. Not allowing enough space to hold water on the surface of the pot.
3. Not enough water on hot days and during the Fall and dormancy. Soil tends to look moist at the latter times, due to the heavy dews, but may be dry underneath.
4. Too much water(mostly a matter of poor drainage).
5. Poor attention to insect and fungus infestation; all year, but especially early and late in the season.
6. Neglecting dormant spray. (See the follow-on notes.)
7. Leaving wire on too long. Check at least every three months.
8. Poor positioning on the shelves: failure to rotate the trees frequently. Find out which trees like full sun or full shade, or morning sun and afternoon shade.
9. Failure to keep fertilizing records so you know when you last used fertilizer.
10. Improper winter care and protection (too little too late).

Other Winter tips: all evergreens will benefit from a strong hosing down every month or so. All deciduous trees should have a dormant spray on a sunny day in January, and perhaps once again before the buds swell. Your worst Winter pest is the red spider, particularly prevalent under conditions where there is no overhead moisture. Hosing and dormant spray will help; otherwise use KELTHANE.