Increasing Scholarly and Academic Knowledge about LBG: Developing a Webpage and Prospectus

Report Submitted to:

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This report is the product of an education program, and is intended to serve as partial documentation for the evaluation of academic achievement. The report should not be construed as a working document by the reader.

Abstract

Currently, Lankester Botanical Gardens (LBG), located in Cartago, Costa Rica, would like to become the Mesoamerican Center for Orchid Research and Taxonomy through the implementation of its masterplan. LBG has proven to be an excellent research and education institution. However, LBG still lacks the visibility and support to attract prominent researchers from around the globe. Surveys and interviews with previous collaborators were used to determine what their expectations of LBG are. A prospectus and website outline were created to market LBG's strengths and potential to students, researchers, and ecotourist organizations. Eight highly respected botanical garden websites were studied to identify features most suitable for LBG's website. We then provided recommendations for the implementation of this website and for the distribution of the prospectus.

Authorship Page

This project was produced through a collaborative effort on the part of both team members. Each member played an important role in all sections of this report. Please regard all sections of this report as a single document produced by our team.

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Executive Summary

This report was prepared by members of Worcester Polytechnic Institute Costa Rica Project Center. The relationship of the Center to Lankester Botanical Gardens and the relevance of the topic to Lankester Botanical Gardens are presented in Appendix A.

Lankester Botanical Gardens (LBG), located in Cartago, Costa Rica, contains one of the most diverse collections of epiphytes in Central America. LBG has recently addressed the problem of epiphyte extinction by improving its research and conservation programs. A masterplan has been drafted to outline LBG's plans to expand and achieve its goals in the next ten years. However, LBG's lack of visibility and funding prevent it from gaining the reputation necessary to attract the most prominent epiphyte researchers from around the globe. Our objective in this project has been to design a website outline and prospectus brochure to communicate LBG's strengths and potential to present and future constituents, namely researchers, students, and orchid-conservation organizations. This effort to extend knowledge about LBG will hopefully lead to partnerships that will benefit both LBG and its potential collaborators.

Orchids, a type of epiphyte species that grows on other plants, such as trees, are in danger of extinction. LBG's goals and vision are to promote conservation of orchids through research and environmental education. Thus, there needs to be a way for LBG to communicate its scientific discoveries, publications, and potentials to researchers and conservationists. The way we are recommending to do this is through a prospectus about the garden and the World Wide Web. Currently, LBG's website does not portray its potential accurately, and there is no document that could describe its strengths in research circles. We aim to promote LBG's success by communicating these plans to the

scientific community and making all types of audiences more knowledgeable about all LBG has to offer.

In designing the prospectus, we took into account what each potential partner hopes to gain from a connection with LBG. We obtained this information through surveys of each type of potential partner: researchers, students, and philanthropic organizations. The elements of the masterplan, in particular, plans for expansion and facility upgrades thought most desirable by each potential partner, were included in the prospectus. Furthermore, four experts were interviewed at three different botanical research stations that have achieved the research prominence sought by LBG. They provided advice regarding how they have obtained support and how they had grown from modest beginnings into a position of global recognition. It became evident through these sources that a website and an organized dissemination of plans, through a prospectus, are critical for LBG in achieving broad-based recognition as a center of research excellence.

The outline of the website was generated from a visual survey of eight other botanical garden websites. The most noteworthy attributes of each website, in terms of content and organization, were incorporated into the LBG webpage. These elements included items such as "Visitor information," "About LBG," "What's new", "Research," and "Education." The prospectus is similar in content to the webpage, except it emphasizes past, present, and future research endeavors of LBG, and it is directed more towards the scientific community. The prospectus seeks out scholars interested in epiphyte research and organizations interested in funding such endeavors. An important aspect of the website is a "How You Can Help" section, which explains why and how people should support LBG. Both the website and prospectus reinforce each other.

Distribution of the prospectus will need to be direct and formal. It will reach out to botany departments and other scholars who have interests in the work of LBG as well as organizations interested in supporting orchid conservation. The prospectus should be mailed or faxed to people or organizations who would be most interested in learning about or visiting LBG. It will also contain the URL of the website. The website, of course, will need to contain aesthetically pleasing background and pictures, in addition to being updated regularly by a skilled webmaster. Both the prospectus and website will have versions in both English and Spanish in order to increase their outreach.

We anticipate that communication of LBG's services and potential will be improved through LBG's new website and prospectus. A reliable email system must also be arranged to follow up on questions and information requests. The prospectus would reach out to audiences who do not have regular access to the web, such as the Costa Rican community. Moreover, the prospectus summarizes the work of LBG and discusses why researchers, students, and ecotourists should visit and join LBG. Most foundations which provide funding to organizations such as LBG expect a prospectus to explain the organization's plans and progress. It is our hope that both the prospectus and website will allow LBG to increase its research productivity and provide the visibility LBG needs to become the Mesoamerican center for orchid research and taxonomy.

RESUMEN EJECUTIVO

Los Jardines Botánicos de Lankester (JBL) localizados en Cartago, Costa Rica, contienen una de las más variadas colecciones de epifitos en Centro América. Los JBL se han concentrado recientemente en enfocar el problema de la extinción de epifitos mejorando los programas de investigación y conservación. Un plan maestro ha sido diseñado para esquematizar los planes de los JBL para expandir y lograr sus metas en los próximos diez años. No obstante, la falta de visibilidad y financiamiento de los JBL evita que logre la reputación necesaria para atraer los más destacados investigadores de epifitos del globo terráqueo. Nuestro objetivo en este proyecto ha sido de diseñar un esquema de un sitio de web y un folleto informativo para comunicar las fortalezas y potencial de los JBL a los presentes y futuros personeros, especialmente investigadores, estudiantes y organizaciones dedicadas a la conservación de las orquídeas. Este esfuerzo para extender el conocimiento acerca de los JBL podrá en forma prometedora a nuevas asociaciones que se beneficiarán tanto a los JBL como a sus colaboradores potenciales.

Las orquídeas, un tipo de especies de epifitos que crece en otras plantas, tal como árboles, están en vías de extinción. Las metas y visión de los JBL son de promover la conservación de orquídeas a través de la investigación y educación ambiental. Por lo tanto, es necesario descubrir una forma para que los JBL puedan comunicar sus descubrimientos científicos, publicaciones y potencial a investigadores y conservacionistas. La forma como recomendamos lograr este objetivo es a través de un folleto informativo sobre el jardín como también a través del Internet. En el presente, el sitio de web de los JBL no demuestra su potencial en forma exacta, y no existe ningún documento que describe su fortalezas en los círculos de la investigación. Es nuestro propósito promover el éxito de los JBL

comunicando estos planes a la comunidad científica y hacer que todo tipo de audiencias tenga mayor conocimiento de lo que los JBL ofrecen.

Al diseñar el folleto informativo, se tomó en cuenta lo que cada socio potencial espera lograr con su relación con los JBL. Se obtuvo esta información a través de encuesta de cada tipo de asociado potencial: investigadores, estudiantes, y organizaciones filantrópicas. Los elementos del plan maestro, en particular, los planes de expansión y el mejoramiento de las instalaciones que se consideren más deseables para cada asociado potencial fueron incluídos en este folleto. Además, cuatro expertos fueron entrevistados en tres diferentes estaciones de investigación botánico que han logrado la prominencia científica buscado por los JBL. Ellos dieron consejos con respecto a como ellos obtuvieron el respaldo y como ellos habían crecido de comienzos modestos a una posición de reconocimiento global. Se evidenció a través de estas fuentes que un sitio de Internet y una diseminación de los planes, a través de un panfleto informativo, son de suma importancia para los JBL para lograr esa forma amplia de reconocimiento como un centro de excelencia investigativo.

Este esquema del sitio de web se concibió por medio de un estudio visual de otros ocho sitios de web de jardines botánicos. Los atributos de mayor notoriedad de cada sitio de web, en términos de contenido y organización, fueron incorporados en la página web de los JBL. Estos elementos incluían ítemes tales como "Información para el visitante", "Sobre los JBL", "¿Qué hay de nuevo?", "Investigaciones" y "Educación". El prospecto es similar en contenido a aquél de la página web, excepto que este enfatiza en investigaciones pasadas, presentes y futuras de los JBL, y está mayormente dirigida hacia la comunidad científica. El prospecto busca escolares interesados en los esfuerzos de investigación sobre epifitas y organizaciones interesadas en financiar estos esfuerzos. Un aspecto importante

del sitio web es una sección que se llame "¿Cómo puedes ayudar?", y que explique por qué y cómo las personas deberían apoyar a los JBL. Ambos, el sitio web y el prospecto se refuerzan el uno al otro.

La distribución del prospecto necesitará ser directo y formal. Alcanzará departamentos de botánica y otros escolares que tienen interés en el trabajo de los JBL así también como organizaciones interesadas en apoyar la conservación de las orquídeas. El prospecto deberá ser enviado por correo electrónico o fax a las personas u organizaciones quienes estén más interesadas en aprender sobre o visitar los JBL. También incluirá la dirección de la página web. El sitio web, naturalmente necesitará contener una imagen y fotografías estéticamente agradables, además de ser renovado regularmente por un webmaster calificado. Ambos, el prospecto y el sitio web tendrán versiones en inglés y en español, esto con el objetivo de incrementar su alcance.

Se anticipa que la comunicación de los servicios y el potencial de los JBL serán mejorados a través del nuevo sitio web y prospecto de los JBL. También se tendrá que establecer un sistema confiable de correo electrónico para poder responder a las preguntas y las solicitudes de información. El prospecto alcanzará audiencias que no tienen acceso regular a la red como lo es la comunidad costarricense. Además, el prospecto resume el trabajo de los JBL y discute por qué los investigadores, estudiantes y eco turistas deberían visitar y unirse a los JBL. La mayoría de las fundaciones que proveen financiación a organizaciones como JBL esperan que un prospecto explique los planes y progresos de la organización. Se espera que ambos, el prospecto y el sitio web permita a los JBL incrementar su producción investigativa y proveer la visión que los JBL necesita para convertirse en el centro mesoamericano de la investigación y taxonomía de orquídeas.

Chapter 1. Introduction

Worldwide, rainforests are quickly disappearing, thus causing the destruction of epiphytes that grow within them. Epiphytes, such as orchids, are a variety of plant that grows on other plants, particularly trees, but do not draw sustenance from them. One way epiphytes are valuable for rainforest ecosystems is through the conservation of moisture. Costa Rica is one country where many species of epiphytes are still prevalent because of its outstanding biodiversity and its active conservation programs. However, Costa Rica does not yet have a well-known research center for the study of epiphyte taxonomy and ecology.

Lankester Botanical Gardens (LBG) is located in Cartago, Costa Rica, and specializes in the collection and study of epiphytes. LBG contains over 20,000 different plants with 1,100 different species of orchids, hence having the largest collection of orchids in Central America. In recent years, LBG has enhanced its research activities and could become the major research center for epiphytes that Costa Rica and the world needs – The Mesoamerican Center for Epiphyte Research and Taxonomy. LBG organized an international seminar in 2001, the Mesoamerican Seminar on Orchidology and Conservation, and it has published the *Epidendrum* newsletter since October of 2001. This newsletter describes many of LBG's recent conservation activities. Additionally, the LBG journal *Lankesteriana* describes many diverse past and present research projects sponsored by LBG, including investigations of orchid taxonomy, phylogeny, and the study of conservation genetics. Furthermore, LBG desires to become an international center studying epiphyte biodiversity, conservation, and ecological interactions with other species. Thus, LBG can be considered a "hidden jewel" of Costa Rica.

Because LBG has such substantial experience with orchids and their maintenance, it seeks to make its collections more widely known among researchers and horticulturists and to study epiphyte interactions with various ecosystems. Of particular importance are the possible effects of epiphyte loss within Costa Rica. Bringing greater recognition to LBG would make Costa Rica into an important site for epiphyte researchers to visit from around the world. In addition, LBG would like to link its projects to tourism and education. In summation, ecologists, botanists, and philanthropic societies would all benefit by greater knowledge of LBG research on epiphyte conservation and by greater access to its extensive epiphyte collections.

At the present moment, LBG has a high quality research program and staff, as evidenced by the research and conferences that LBG has sponsored. However, small size and lack of sufficient support from external organizations have prevented it from recognizing its full potential and thus receiving suitable external recognition on a par with its activities. Hence, LBG has drafted a masterplan which outlines its goals for the next decade. Several of these goals include the expansion of services such as research, education, and tourism. For example, one element of this masterplan involves the construction of a research building that will be used by epiphyte biologists. Another element includes an agreement with Cleveland Botanical Gardens, which is planning on constructing an orchidarium at the LBG site to house samples of LBG's sizable collection of epiphytes. LBG would also like to present itself as a partner to various organizations that sponsor ecotourism and market epiphyte-related products, such as pharmaceutical companies. Other plans include the design of a database system for epiphyte taxonomy that researchers all over the world could utilize. Implementation of this masterplan

would solicit the support required to continue the activities that will allow LBG to achieve its mission and goals.

Our goals in this project are to help LBG disseminate information about its strengths and future plans to outside organizations and individuals that share common goals with LBG by developing a brochure-like prospectus and an outline for a website. The purpose of the prospectus is to provide a hard copy of important information regarding LBG's location, history, past activities, current projects, and future plans to professionals in the field. This will convey LBG's current strengths and potentials for improvement. The website is a mechanism by which LBG can efficiently reach a wider audience, attracting potential members, tourists, researchers, and students worldwide. Many scholars, including those at LBG, agree that both the World Wide Web and brochures are important avenues of communication to be able to reach a broader audience. Closer partnerships between LBG and other botanical organizations will assist LBG in obtaining resources necessary to achieve its masterplan.

In order to develop the website outline and prospectus, we contacted people and organizations who have collaborated with LBG, such as researchers, students, and benefactors, to determine how LBG could make its resources and expertise more available to scholars and the wider horticulture community. We also analyzed the content and organization of eight major botanical garden websites to determine the outline and layout most suitable for the LBG website. In addition, we interviewed administrators at three other botanical centers who have successfully achieved public recognition to understand their marketing and promotion plans, including their use of websites and brochures, and to apply their strategies to LBG's website and prospectus.

The prospectus was written to present prioritized areas that other organizations, research centers, or benefactors desired from LBG, as well as LBG's vision and plans for expansion. The final version of the prospectus is intended to be distributed among researchers, students, orchid-lovers, and other institutions who work in botany. An outline of LBG's website, in terms of content, organization, and layout, was developed based on the visual survey of the eight other websites. The website will be implemented by a friend of the garden, Mr. Walter Schug, to market LBG's image and growth plans electronically, to a vast, wider group of people.

The website will contain many of the points in the prospectus. In order to properly design the prospectus to convey LBG's masterplan, LBG's most important services needed to be described. Furthermore, recent improvements in LBG's services, collections, and resources needed to be emphasized in order to highlight LBG's potential for further growth in these areas. We took into account potential areas of development such as the proposed enhancement and expansion of research projects to attract more scholars, as well as the graduate-level courses that will be offered as an outreach to university students. Essentially, the prospectus is designed to convey the important strengths and future plans of LBG that will appeal to ecologists, horticulturists, academics, tourists, orchid-preservation societies, ecotourist organizations, and other botanical research centers. LBG's potential areas of development need funding from philanthropic organizations, for instance, organizations concerned about epiphyte conservation, and the prospectus can be used to communicate this need to potential donors. The first recipients of the prospectus will be those whom we surveyed.

Once the prospectus is distributed to potential partners and benefactors of LBG, the garden can pursue collaborative relationships that will allow it to fulfill the goals of its masterplan. An enhanced website will be another source of information to such potential constituents and will provide more details about the garden's strengths and future plans. As the number of partners increases, funding and resources will increase. This will allow LBG to improve the quality of programs, thus further enhancing the garden's visibility, and again, the number of partners will increase. In other words, this cycle will continue to expand LBG's base of support. Over time, LBG will benefit from this cycle of recognition and be able to play a major role in saving endangered orchid species from becoming extinct.

Chapter 2. Background and Literature Review

2.1. Introduction

This literature review contains background information on the dynamics of developing, managing, and marketing a botanical research center. Information relevant to this project, such as a brief description of the study of epiphytes, financial planning, and management of a research center, is examined. In addition, aspects of capital campaigning and promotion of a research center through prospecti and websites are discussed. The goal of this literature review is to thoroughly study the fundamental steps needed to develop, sustain, and promote a botanical research center, such as LBG, so that it is achieves its goals.

2.2 Botanical Gardens

A botanical garden can be defined as a public place that cultivates and manages live plants for scientific, educational, and decorative purposes (Widmoyer, 2001, p.314). Botanical gardens usually have a herbarium, a library, a greenhouse, and other materials for research use. Displays, which exhibit the plants, are informational and usually contain the Latin name of the plant species as well as some background information about the plant's habitat and its behavior.

There are currently over 1,600 botanical gardens worldwide, with an estimated 150 million visitors each year (BGCI, 2002). Many visitors come to educate themselves about the botanical life of their surrounding area and to view the artistic arrangement of plants. Also, it is the intent of most governments to subsidize these gardens, so that people can continue viewing and learning about different plants. The Governments usually team up with the botanical faculty of a university in order to support the further study and care of the plants.

2.2.1 Botanical Databases

Plant computer database programs have been instrumental in offering botanists new methods of accessing vital information needed in research (Allen, 1993, p. 1). Computerized information offers increased efficiency, access to unpublished records, and new ways of asking questions. Taxonomic studies are immensely enhanced through a computer system. This is one reason why LBG has been considering implementing a web server and database. Computerized databases allow researchers to log into databases from thousands of miles away. For example, Missouri Botanical Garden maintains a plant database called TROPICOS. This has allowed researchers to obtain updated bibliographies on recent scientific literature on as many as 50 species around the world, as well as a wealth of information on a wide variety of topics. Furthermore, researchers are instantly able to contact a large number of colleagues whose expertise is on the plant species in the database. Essentially, researchers are now able to obtain valuable information from one garden's database that would have taken months of correspondence or travel just ten years ago.

A computerized system is most valuable when it comes to efficiently retrieving and manipulating data. Many researchers have claimed that databases have enabled them to become more efficient and also have allowed them to ask questions and communicate with fellow researchers thousands of miles away (Allen, 1993, pp. 1-6). The Missouri Botanical Garden has become a leader in the effort to computerize plant information (Allen, 1993, p. 1). Its TROPICOS database system was launched in 1983 and contains information on more than 400,000 plants from around the world. Tasks performed by the database system include routine herbarium management, such as producing plant specimen labels and maintaining specimen loan and exchange

records. The database also communicates with a Chinese database, which is expected to produce the first modern description in English of China's more than 28,000 species of plants (Allen, 1993, p.2).

TROPICOS is progressing in several dimensions (Allen, 1993, p. 2). Taxonomists use the computer to record plant collection information, which is then transferred into Missouri's main computer system. There are several projects set up within TROPICOS, each of which identifies plant species in a different region of the world. For example, the Flora of North America (FNA) branch is expected to produce a set of printed journals, as well as a major database for North American flora.

The FNA branch plans to develop the first fully electronic floristic research project (Schnase et al., 1997, p. 1), resulting in an ever-expanding, continually-refined digital library containing scientifically authoritative, up-to-date information on 20,000 species of vascular plants and bryophytes north of Mexico. Because FNA is such a huge project, the design of the scientific database needed to be re-conceptualized. According to Schnase, FNA has brought about a new era of database publishing, which combines the virtues of the database with cutting-edge scientific research. Schnase also indicates that the way knowledge is shared has changed through database and internet systems, and the organization of scientific inquiry has been altered to an amazing degree.

Plant databases typically contain plant names, synonyms, geographic distribution, description, chromosome numbers, literature, information from specimen labels, and locations of the type of specimen and of living collections (Allen, 1993, p. 2). Usually the user of the database is able to learn of the collector of the original samples, where the plants were found, and where other specimens are located.

Additionally, in the case of TROPICOS, a bibliography option is provided so users can gain access to titles of key publications on each species and information on the botanists who worked on them. In summation, the database system saves time, effort, and money. Let's suppose a pharmaceutical company discovered something useful about a certain plant species, which could be an ingredient in a potential pharmaceutical product. Instead of traveling to various herbaria and copying information by hand, they could sit down and retrieve more information from their computers. Similarly, LBG's database and server can provide international researchers with information.

The Germplasm Research Information Network, or GRIN, not only helps a botanist obtain information about a species, but actually can ship plant material to his lab (Allen, 1993, p. 3). GRIN is maintained by the US Department of Agriculture. According to James R. Ault, a botanist at Longwood Gardens, GRIN is a taxonomic tool where literature is cited for every species. The correct name, the scientific authority, and the plant's origin are also given.

Computer databases are also an important element in plant conservation, by keeping a prioritized record of which plants are most endangered (Allen, 1993, p.3). Additionally, plant databases can provide the conservation community with a clear picture of where the threatened plants are and what work has been accomplished on germination rates, propagation techniques, or other aspects of the biology of the endangered species.

A database can provide relational information, in terms of evolutionary relationships (Allen, 1993, p. 4). For example, a link can be discovered between geographic areas of plants and habitats of certain kinds of animals. Some databases may also produce maps to aid researchers in examining the correlation between plant

development and climate change. These maps can be updated and reprinted by computer as new data come in.

Although botanical databases contain much promise, they are not cheap to create or maintain. They are tough to implement in comparison to other science-related projects for this reason. For example, the Harvard Herbarium's database requires $27,000 for a programmer, $120,000 for three years of data entry, and $16,000 for communications and computer hardware (Allen, 1993, p. 5).

Sometimes, the data entered into the database may cause confusion. For instance, a piece of information from one database may be transferred around enough so that the original source is lost (Allen, 1993, p. 5). Hence, botanical databases from different locations need to use a common language of communication. Skilled programmers and staff must be hired to maintain the database. Quality control must be carefully examined when implementing a botanical database. LBG must seriously consider the cost versus value requirements of a database and should design the computer server to deliver the optimum information on its webpage.

The issue of communication between various garden's databases is being addressed by the formation of a consortium of collaborators. These collaborators bring to the table a joint computer system which maximizes access to all scientific collections and research data held by them (Allen, 1993, p. 6). Some of the institutions involved in the consortium include the Missouri Botanical Garden, the New York Botanical Garden, the American Museum of National History, the California Academy of Sciences, and the Carnegie Museum of Natural History. The collections are vast; they together contain 30% of the 60 million herbarium specimens in the United States (Allen, 1993, p. 6). If LBG were to join such a consortium, its scientific resources would surely increase phenomenally.

A group of scientists and researchers, along with E.O. Wilson, professor emeritus at Harvard University, and Peter Raven of the Missouri Botanical Gardens, have put forth a global initiative to identify and classify every living species on Earth in the next 25 years (K.P., 2001). The final number is estimated to be between 7 million and 100 million. The group estimates the project will last 20 years and will cost approximately $20 billion. The final product is planned to be in the form of a database. Although many are skeptical about the task, it would not even be conceivable without the use of a computers.

2.2.2 Epiphytes

Epiphytes, or "air plants", grow on top of other plants without drawing sustenance from them. Epiphytes are an extremely valuable resource in Costa Rica, as they have continued to display their ecological, cultural, and socio-economic benefits throughout the years (Butler, 2001).

One of the main habitats of epiphytes, such as orchids, is in the canopies of rainforests (Butler, 2001). Over eight percent of the vegetation in the rainforest canopy in Costa Rica is epiphyte matter, and the ecosystem atop these trees is highly dependent upon these plants. There are many species that are unknown, and some are believed to have medicinal purposes. Lowman and Wittman (1995, p.164) point out that the study of epiphytes has a key role in understanding the ecosystem of the rainforest and could have benefits in medicine as well.

Epiphytes include ferns, mosses, orchids, bromeliads, cacti, and even certain species of tree (Salisbury, 1970). Their populations reach their zenith in warm lowland rainforests and cool cloud forests of tropical regions such as Costa Rica.

Nonvascular epiphytes such as mosses, liverworts, and lichens play key roles in water interception, which influences hydrological balance in tropical montane systems (Romero, 1999). Epiphytes are able to conserve water in tropical forest systems, thus they are important to the rainforests as well. These plants are also important to the traditional production and heritage of Costa Rica and are thus valuable among non-timber forest products. They have been valuable for their perfume, aesthetic, and medicinal products.

2.2.3 Costa Rican Biodiversity

Due to the fact that Costa Rica is situated between North and South America, Cost Rica is home to a wide variety of plant and animal species from both continents. This fact makes Costa Rica an ideal location for botanical research. Additionally, Costa Rica's ecological policy is protective of its natural territory. It contains approximately 12,000 plant species and 300,000 insect species, of which it is estimated eight percent have not yet been described (Cozic, 1998, p. 79). Costa Rica is also home to over 9000 identified vascular plants, including many epiphytes. It is thought to have more biodiversity per acre than any other nation.

Because Costa Rica is very keen on preserving its natural resources, it welcomes foreign researchers and investors (Davis et al., 2001, p. 5). Many foreign pharmaceutical companies have explored tropical rainforests in Costa Rica for potential medicinal plants. Thus, the Costa Rican rainforests attract an ample number of visiting pharmaceutical researchers as well. Currently, there are 107 companies in the United States that are researching tropical forest plants for medicinal purposes.

2.3 Description of Various Botanical Research Centers

Other botanical gardens with renowned research centers are potential models of growth for Lankester. Therefore, we will now examine several botanical research centers and how they operate.

2.3.1 Harvard Herbarium

A herbarium can be defined as a library of dried, pressed, individual plants, kept in plastic sleeves on shelves, with descriptions enclosed (HUH, 2001). These descriptions document information about each plant, covering such information as its Latin and local names, as well as its uses, distribution, and ecology.

The Harvard Herbarium, located in Cambridge, Massachusetts, boasts the eighth largest and one of the most comprehensive collections of dried plant matter in the world, with over five million species cataloged (HUH, 2001). The entire catalog is stored in an enormous database, for convenience. Researchers and students (mostly graduate students) use this database to compare species and to educate themselves about the plants' uses and their ecological impact.

The herbarium is a vital tool when it comes to the discovery of new plants, and how they should be classified, because the information that is currently known about similar plants is logged here, and comparisons can be made to categorize each new plant (HUH, 2001). A herbarium is considered to be a significant aspect of a well-designed research center, as it initializes much of the research that occurs there. The inclusion of a herbarium at Lankester Botanical Gardens would benefit this center in particular because the target of research is epiphytes. There are over 15,000 different species of tropical epiphytes alone, with a surplus of uncatalogued species (Butler, 2001).

2.3.2 Belize Botanic Gardens

The Belize Botanic Garden, located in San Ignacio, Belize, is host to thousands of plants, including many of the same epiphytes that are studied at LBG (BBG, 2002). Belize Botanic Gardens wishes to continue the cultivation of its plants, for educational purposes, but also to promote the local tropical flora. The government, industries, scientific and nonscientific communities, and students use the information provided here for various reasons. To provide this wealth of information, to protect and conserve the Belizean flora, and to perform ecological studies on the plants is the intent of the botanists that run the Gardens.

Belize Botanic Garden (BBG) is still under construction (BBG, 2002). As at Lankester, there are many future plans for this place since both require more support to carry out larger expansion. Some of these plans include: the construction of a herbarium, an orchid house, a nursery, lecture halls, a laboratory, a seed and fruit processing area, and a dining area. It is also planning to eventually reconstruct eco-zones of Belize. Studying these zones will help to further understanding about the ecological structure of the plants and their interactions with each other and other elements of the rainforest environment. BBG's ultimate goal is to recreate specific ecosystem environments within Belize, such as a riverine ecosystem, which mimics the actual environment of Belize. Also, BBG will attempt to emphasize education of young people regarding sustainable development and botany.

Conservation is also a priority of the BBG, in that a living collection of plants will need to be maintained within the facility in order to replenish any threatened native plant species (BBG, 2002). BBG will be collaborating with the Ministry of Agriculture and the Ministry of Forestry in Belize in order to find economically feasible plants that are able to be maintained and sustained. In sum, the main goals of

BBG include promoting horticulture, agriculture, conservation, education, and pleasure (BBG, 2002).

Funding is one of the main issues at Belize Botanic Gardens (BBG, 2002). With the urgent need of an irrigation system and plans for much construction, a grant proposal is available for anyone who takes an interest in funding the site. The proposal includes the costs and requirements of the Garden, in order to get these projects initiated, and forecasts for the upcoming three years of operation. The Garden has plans to eventually make the development of its site to be self-sustaining, once there are enough donations. One source for getting donations is the BBG's website, which offers a rationale to the donor and a means to contact the Garden in order to donate or to do volunteer work (BBG, 2002).

Currently, the botanical garden has over 300 orchid plants, representing 90 different species (Davis et al., 2001, p. 9). Construction of an Orchid House, 100' x 25' x 30', has been planned to showcase orchids. According to Davis, several elements that will potentially be included in the building are irrigation, soil, orchid collections, transplanting of large trees, installation of orchids and plants, 3 water pumps, waterfall, fake limestone cliff, walkways, as well as a small pond and bridge. The BBG staff also plans on expanding by including a classroom. The predicted cost of the entire classroom, new laboratory, and herbarium have been estimated to be $22,500.

2.3.3 Missouri Botanical Garden

Founded by Henry Shaw, the Missouri Botanical Garden was conceived over 140 years ago, in 1885 (MoBot, 2002). Inspired by a visit to botanical gardens in London, England, Shaw returned to St. Louis, Missouri, and began to plan and

formulate a botanical garden of his own. He based his garden on three objectives: research, display, and education.

The Missouri Botanical Garden aims to discover and share knowledge about plants and their environment, in order to preserve and enrich life (MoBot, 2002). One of the largest international research centers in the world, the Missouri Botanical Garden implements programs aiming to sustain and manage limited resources, protect the diversity of life on the planet, and share its discoveries through educational programs.

Currently, Missouri Botanical Gardens shares a partnership with Saint Louis University (SLU), Southern Illinois University at Edwardsville (SIUE), and University of Missouri, St. Louis (UMSL) (Davis et al., 2001, p. 13). Along with Washington University – St. Louis, these three schools have formed a consortium with Missouri Botanical Gardens and have coordinated their graduate biology programs. While the students receive their degrees at the universities, they are offered access to MBG's research facilities and staff. In terms of the research facilities at MBG, the library is one of the finest botanical libraries in the world. This library contains over 2,000 journals and 9,000 volumes of rare books. It also contains an extensive array of reference material, such as dictionaries encyclopedias, handbooks, and indexes, numbering over 3,000. Additionally, there is an online catalogue available through the website.

Perhaps the most intriguing aspect of MBG is how its press plays a role in its research program. It publishes quarterly journals, such as the *Annals of the Missouri Botanical Garden* and *Novon,* as well as books, such as the series *Monographs in Systematic Botany from the Missouri Botanical Garden.* Publishing journals is an

important method by which MBG shares and promotes its research. MBG's website allows individuals to subscribe to these journals.

Missouri Botanical Gardens runs projects around the world, namely conservation projects in Africa and Madagascar, and a three-year collaborative program with Tanzania (MBG, 2002). Specifically, the project in Madagascar is funded through the John D. and Catherine T. MacArthur Foundation, the Liz Claiborne and Art Ortenberg Foundation, the National Science Foundation, the National Geographic Society, and LWO, Inc. The purpose of the collaboration of MBG and the Madagascar site is to assist in conservation planning by identifying the endangered species, as well as to train and eduate Malagasy scientists and students. The project in Tanzania is also intended to promote conservation and training of students, as it includes a network of resident collectors throughout the country and on-site training for the country's botanists. Particularly, the training includes plant identification and field techniques. The activities in Tanzania are funded through many of the same organizations that fund the activities in Madagascar.

2.3.4 Smith Botanical Garden

In May of 1894, the Botanic Garden of Smith College was created and directed under the guidance of William Francis Ganong, a professor of botany (SBG, 2002). Located in Northampton, Massachusetts, the herbarium serves as a reference collection for checking the identities of plants collected in scientific studies, provides material to aid teaching of courses in plant science, is a historical archive, and provides a source of materials for botanical illustration. The Botanic Garden of Smith College strives to provide appropriate facilities for four major programmatic areas: teaching, research, work/propagation, and public functions.

The Smith Botanical Garden also includes plants and books, and other resource materials such as their newsletter, Botanic Garden News (Davis et al., 2001, p. 24). Additionally, activities such as an international seed exchange program, research and conservation events, and the showcasing of their resources help to bring recognition to Smith Botanical Gardens. The Garden offers two 10-week summer internships at the Royal Botanic Gardens, Kew, in London. Fellowships are offered to the interns as additional assistance.

2.3.5 Wilson Botanical Garden

Wilson Botanical Gardens, (WBG), along with Las Cruces Biological Station, is one of the leading research stations in southern Costa Rica (CostaRicaTours, 2002). Some of the pleasantries of WBG include exotic plants, the beauty of birds, and personalized service to welcome guests. Well-maintained trails make visiting and touring the Wilson facility enjoyable. More than 1,000 genera in 212 plant families can be seen along the trails (OTS, 2002). Also, the Wilson Botanical Garden Odyssey, a 3-day tour of Wilson starting from San José, presents a very amenable guide to Wilson Botanical Garden for tourists. The garden is managed by the Organization for Tropical Studies (OTS), described later. WBG, because of its location in the most ecologically diverse country in the world, is able to bring researchers from around the world to develop conservation projects in collaboration with the local people.

2.3.6 Cleveland Botanical Gardens

The Cleveland Botanical Gardens in Ohio is home to many different formal and natural gardens. It has recently renovated and developed the Eleanor Armstrong

Smith Glasshouse, which is scheduled to open to the public in Fall, 2003 (CBG, 2002, homepage.) This is a magnificent conservatory that will house examples of two of the world's most fragile ecosystems: the spiny desert of Madagascar and the cloud forest of Costa Rica. This new Center is intended to transform Cleveland Botanical into a vibrant tourist attraction. Thus, an infrastructure allowing the display and information about epiphytes in Costa Rica, through the New Research Center at LBG, would be beneficial.

Cleveland Botanical contains ten acres of well-landscaped, distinctive, nationally renowned gardens (CBG, 2002, homepage). Various permanent gardens include Hershey's Children Garden, Japanese Garden, Mary Ann Sears Swetland Rose Garden, Nona Whitney Evans Memorial Reading Garden, Western Reserve Herb Society Garden, and Woodland Garden (CBG, 2002, homepage). All these permanent, public gardens serve to showcase Cleveland Botanical's wealth of expertise with flora. They also help attract tourists and scientists from all over the globe. Additionally, there was a flower show from May 30 till June 2, 2002, which showcased the largest outdoor flower exhibition in North America -- 12 acres.

2.3.7 Organization for Tropical Studies (OTS)

The Organization for Tropical Studies (OTS) is a large consortium of 64 universities and research institutions from the United States, Latin America, and Australia (OTS, 2001). American scientists have already managed to collaborate with faculty at the University of Costa Rica to enhance education and research in tropical biology. In order to operate, OTS conducts graduate and undergraduate education, facilitates research, participates in tropical forest conservation, maintains

three biological stations in Costa Rica and conducts environmental educational programs.

For projects with a long-term commitment, OTS funds and manages its own projects (OTS, 2001). Projects at lower levels are funded by teams of international scientific collaborators. OTS also offers fellowships to graduate students in order to attract graduate researchers of the highest quality. OTS is managed by a Board of Directors, which manages business between the annual spring meetings, a research committee, composed of faculty from schools such as U.Conn and U.Missouri, a Financial Investment Advisory Committee, composed of business leaders from institutions such as the Smithsonian, and a Budget Review Committee.

2.3.8 La Selva Biological Station

La Selva Biological Station was established by Dr. Leslie Holdridge in 1954 and acquired by OTS in 1968. Over 240 papers are published yearly from the research conducted on-site (OTS, 2002). La Selva has proven to be a "mecca" for scientists and naturalists alike and is one of three biological stations in Costa Rica owned and operated by OTS. The studies being carried out at La Selva represent the forefront of our knowledge about tropical rainforest biology (costaricaexpeditions, 2001). The station is primarily geared towards researchers and the educational community. It contains a very bright and large dining hall, where students and scientists are able to discuss their research over meals in a comfortable context. The La Selva tour guides have been labeled as among the best in the country (costaricaexpeditions, 2001).

La Selva originally began as a farm. OTS then bought the farm from Dr. Leslie Holdridge in 1968 to administer courses at the site, particularly in Tropical

Ecology (personal communication, Matlock, 2002). The mission of both OTS and La Selva is currently to promote education, research, and the rational use of resources in the tropics. The Holdridge house was remodeled into a dormitory for students. A new academic center, a lab, and new paths were constructed recently. Half of La Selva's visitors are ecotourists. According to Dr. Matlock, 40% of La Selva's funding comes from the National Science Foundation, USA.

The continuous funding from the NSF provides almost $500,000 per year (personal communication, 2002). The remaining operating costs come from station fees and from visitors. To fund the construction of buildings and the herbaria, a capital donation was obtained from the A.W. Mellon Foundation. The most important source of marketing and promotion of La Selva comes from the OTS consortium, for there is a common use of resources through this consortium. There is also a station in the United States which assists La Selva with its marketing operations. The ultimate goal is to build an endowment for La Selva to fund its annual operating costs. The La Selva website and software are funded through the operating costs, and most of the large, computer-related equipment is funded through the capital budget. The La Selva Advisory Committee reviews the policy aspects of the management and development at La Selva.

There is an environmental education program in place to provide a meaningful educational experience for local school children. Approximately ten local schools participate in various projects to learn about the importance of rainforest conservation (personal communication, Matlock, 2002). At a higher academic level, the graduate program is accredited by the University of Costa Rica and the undergraduate program is accredited by Duke University. Most of the graduate students participate in research and undergraduates engage in coursework. Most of the courses at La Selva

contain a project or field-work component. Many graduate students have recently come from Germany, deciding to do so because of the attractive site La Selva occupies, i.e., primary tropical rainforest.

2.3.9 Instituto Nacional de Biodiversidad

INBio, or Instituto Nacional de Biodiversidad, located in Heredia, Costa Rica, focuses on promoting a new awareness of the value of biodiversity and conservation (INBio, 2002). Essentially, INBio generates knowledge about biodiversity and communicates this information to a broad spectrum of both Costa Rican and international audiences. INBio's mission is realized through biodiversity inventory at national protected areas, search for sustainable uses and their promotions, organization and administration of biodiversity information, as well as the transfer of biodiversity knowledge.

INBio concentrates on bioprospecting, inventory of specimens, and information management (personal communication, Chaves, 2002). Funding of operating costs at INBioparque, according to Mr. Eric Chaves, is obtained through visitor revenue. The proceeds are often used to fund activities such as building bridges, paths, or exhibits which showcase both animals and plants. Recently, $120,000 was allocated for an advertising campaign and international marketing scheme. An international tourist firm and an international advisor are both helping INBio with its marketing campaign. Additionally, commercials are being sent to various tourist agencies in order to disseminate knowledge of INBio.

Through tour operators, INBio is able to bring school children to its parks. One program also trains school teachers as tour guides. These trained teachers are

then actually able to lead their own students on tours. Additionally, fees are charged for visits to orchid fairs, lectures, and shows that occur at INBio.

2.3.10 Tropical Science Center, Mr. Julio Calvo

The Tropical Science Center (TSC) is a private, non-profit Costa Rican organization established in 1962 (TSC, 2002). TSC is formed by 50 distinguished scientists and professionals both in Costa Rica and internationally. TSC carries out research projects all over the Americas, influencing natural resource management and related policies in over 25 countries. Its primary mission is the acquisition and application of knowledge which concerns the relationship between humankind, biological resources, and the physical environment. TSC was also founded by Dr. Leslie Holdridge.

The largest station administered by the Tropical Science Center (TSC) is the Monteverde Cloud Forest Reserve (personal communication, Calvo, 2002). There are also five other smaller reserve stations administered by TSC. Its educational mission is complemented by courses and seminars. Most of the income, funding, and support for these research stations has come from visitation fees, a trust fund, and environmental services.

The Monteverde Cloud Forest Reserve has 60,000 visitors annually. Approximately $500,000 of net income is generated and invested in trails, bridges, and a trust fund. $300,000 of net income is invested in labs and community programs. Strategic alliances with European universities also provide excellent monetary support. An ideal strategy, according to Mr. Julio Calvo, executive director of the Tropical Science Center, is to develop plans according to need, and then attract partnership and support by emphasizing one piece at a time. It is also important to

diversify research activities and interests as much as possible. Additionally, having more visitors provides the income to invest in research and education. The attractiveness of the Monteverde site provides for a steady stream of visitors.

Plans for the development of the Monteverde Cloud Forest Reserve include management of biological resources. The plans are prioritized based on the amount of visitors and market demands. The resources are channeled accordingly. The strategic management of tourism involves short-term resources. The resources need to be generated through cooperation from partners. Accordingly, proposals need to be written to these partners based on prioritized planning and resource allocation. In a consortium of partners, resources are shared. For instance, if researchers come from Europe to study at the Monteverde Cloud Forest, the German government may pay for their training at the Reserve.

2.4 About Research Centers

Research centers foster the creation of distinctive research and course development and more effectively bring these elements to new and existing audiences (HBS, 2002). They also foster collaboration among scholars of different disciplines, and thus influence practice, scholarship, and education. Ideally, a research center should be a key center of international activity, allowing its members to attain various viewpoints (HBS, 2002). Many times, the members of a research center are able to attain training from overseas, and a number of the centers offer educational programs at the graduate or undergraduate level.

2.4.1 Importance of botanical research stations

Tropical biological field stations play a central role in scientific research and education; they are at the forefront of efforts to understand and protect global ecosystems (Whitesell et al., 2002, p. 55). Biological field stations can range from simple tent camps with few amenities to elaborate, state-of-the-art facilities. Research at these stations may range from molecular biology to applied ecology. Furthermore, biological field stations play a role in information management and taxonomy, which are key factors in comprehending how ecosystems function and how they are affected by human presence (Whitesell et al., 2002, p. 55). Field stations can be in forests, deserts, marine environments, or alpine ecosystems.

Rainforest research is needed urgently because of the tremendous amount of deforestation that is occurring (Whitesell et al., 2002, p. 55). The research must deal with underlying human causes of resource degradation and species loss. The countries where rainforests are found contain some of the richest ecosystems, yet the poorest people. Thus, responding to the threats against ecosystems is difficult in tropical areas because of limited resources and the scarcity of field stations. One argument for the protection of biological diversity is to preserve the economic potential of flora and fauna which have yet to be discovered in these rainforests (Butterfield, 1995, p. 1). Although some progress has been made in the classification of tree species, the value of tropical forests to local humans by outsiders has been discovered much too slowly.

Many pharmaceutical companies are reliant on gardens and research stations for some of their products. For example, Merck is searching Costa Rican gardens and forests for various plants (Society, 1993, p. 1). Pfizer plans to collaborate with New York Botanical Garden (NYBG) in a $2 million, three-year-project to collect and

study plants as the source of new medicines. Under this agreement, NYBG will collect and identify plant samples from rainforests or gardens, all over the world. Then, Pfizer will test extracts from those plants for their potential as disease fighting agents or as leads to such agents (Society, 1993, p. 1). If the extracts turn out to be useful, the company will pay NYBG a large bonus. One quarter of all prescription drugs in the U.S. originate from plants. However, fewer than one percent of the 250,000 worldwide flowering plants have been analyzed for their potential as medicines (Society, 1993, p. 1). The president of Pfizer is optimistic that this collaboration will lead to major advances in both research and in understanding the importance of biodiversity. Thus, research and biodiversity conservation are inseparable.

On May 13, 1997, 179 biological field stations all over the globe were surveyed according to Whitesell et al (2002, p. 55-64). The survey asked for information regarding general station information, research and training activities, and station finances. Most of the stations had been established roughly 30 years ago, with the newest station having opened in 1994. Indeed, many of the stations are remote, for the mean travel time from the nearest international airport was 6.8 hours. Seventy percent claimed to offer medical services, with potable water being the most frequently offered amenity with 88% of the stations providing it. Also, the stations reported that 85% of the area within which studies are conducted are nationally administered lands, including national parks.

The most common ecosystems studied by these field stations are forests (24.1%) (Whitesell et al., 2002, p. 56). The unique features of these particular ecosystems included biodiversity, as reported by 47.3%, food and agricultural production, as reported by 8.6%, and the fact that they served as important habitats for

all species, as reported by 6.6%. Particularly, in Latin America, 63% reported that their stations were designed for the study of forests. According to the survey, 65% of the stations reported a lack of funding as the main reason for not studying an ample number of ecosystems. 27% reported lack of proper administration as well as various political constraints as the reasons for these ecosystems not being studied. 24.5% of the field stations reported that different plant species were the most available to be studied, and 24% explained that the primary reason they studied these plants was because they were endangered.

On average, each month thirty-two researchers, students, or trainees used each station. Almost all (97%) of the stations required their researchers to submit a research application (Whitesell et al, 2002, p. 57). There were as many as 125 projects at each station. 56% of the projects were basic research, 22% were applied research, and 22% were a hybrid of the two. At least 80% kept some record of past research, maintained copies of publications, and maintained data files. Most of the stations reported that most of their projects studied unmanaged natural ecosystems, or species in their natural environment, not agricultural lands. 35% reported that their primary goal in the studies was to promote conservation. The most commonly cited scientific disciplines that the field stations specialized in were ecology and primatology. Other less cited disciplines included immunology and carbonate geology. La Selva, a research station administered by the Organization for Tropical Studies, has provided and tested many current ideas on forest dynamics, tropical diversity, and plant animal interactions (Grieg, 1995, p. 1).

Plant diversity conservation is primarily achieved through seed storage, which is extensively practiced by both the U.S. and China (Gu, 1998, p. 324). Usually, an in-vitro method of seed storage is used to conserve germplasm.

In every field station, the majority of the researchers came from outside the host country. People from the U.S. represented over 30% of the total number of researchers at each station (Whitesell et al., 2002, p. 58), followed by the United Kingdom with 11%, and Germany with 4.7%. Latin American stations reported 48% of their researchers as having come from the United States. Because of the importance of foreign researchers, 92% of the field stations have implemented policies to encourage visiting foreign scientists. Weather was not reported by Latin American stations as having an extremely adverse impact on research. The peak months for use of the research station were most often reported to be June through August and November through January. Usually, these time periods corresponded to times when university classes were not in session.

Almost half of the field stations indicated that they offered education and training activities to generate income, improve public relations and perceptions of the environment, and further their educational missions. (This was most often reported by Latin American Stations.) (Whitesell et al., 2002, p. 58). The educational and training activities included conservation training, geared to local farmers and conservation workers. Other educational activities included courses for students, teachers, and ecotourists. The most popular courses were related to ecology, environmental education, and forest management. Most of the course participants were high school and undergraduate university students. Most of the stations that offered university course credit were in Asia at 90%, followed by Latin American stations at 33%, and then African stations at 12%.

Operating funds came from several sources, including governments, philanthropic organizations, and universities, at 25% of the mean annual operating budget. 23% of the funds came from the station itself, through provided services such

as educational programs, room and meal charges, etc. (Whitesell et al, 2002, p. 59). Trusts and endowments made up only 0.4% of the operating budgets, and only 3% of the field stations had established trusts or endowments to fund their operations. The major source of funding for Latin American stations was self-generated programs, which included courses. Nearly half of the Latin American stations surveyed indicated that they charged a fee to researchers who used their facilities (on average, approximately $19 per day). Of the stations that indicated their tuition charges for students, the average cost was $963 per course.

Most of the expenditures of the stations were for wages, benefits, travel, training, and meals. Equipment and supplies cost 21% of the average annual station expenditure (Whitesell et al., 2002, p. 59-65). Expenditures are also important in maintaining and upgrading existing capital, such as infrastructure, facilities, electrical lines, and road construction. Almost two-thirds of the stations surveyed indicated a plan for capital improvement during the past year. The average expense for capital improvements at each station was $94,706. Latin American stations spent the second highest amount on capital improvements with $66,764, after Asian stations which spent roughly $215,936. Future trends indicate that self-generated sources of funding are expected to increase in the future, along with funds from host country and external universities. Also expected to increase are donations and grants. Expected to decrease are donations from the host country and funds from trusts and endowments. Prices for services are expected to remain constant, although there may be increased expenditure for lab equipment, library acquisitions, staff training, and research supplies.

The most significant obstacle to most of the biological stations surveyed was inadequate funding, reported by 66% (Whitesell, 2002, p. 59). 40% of the stations

reported that some significant, nearby ecosystems were not being studied because of this lack of funding. Acquiring the necessary financial support is a challenging task. Most of the support was received from multiple sources, including self-generated fees. Many of the stations have also been actively promoting their facilities in order to increase station use. One method is to increase utilization during low-use times, when certain ecosystems may not be packed with researchers. Increased revenues can be acquired by expanding the range of scientific disciplines represented at the station. Whitesell et al. indicate that a discipline devoted to the study of human use of resources would be beneficial since human impact on ecosystems and sustainable development are critical issues. Unfortunately, very few of the stations reported having researchers studying sociological or anthropological effects on ecosystems, which is a field with great significance to ecological conservation.

Improving the financial well-being of a field station requires a careful examination of station expenditures (Whitesell, 2002, p. 59). Thus, it is more important for field stations to become just as knowledgeable about expenditure optimization as it is to know about funding sources. In terms of funding options, 85% of the field stations accepted volunteer services. Another good method of funding is through the creation of specially dedicated trusts and endowments since they provide long-term, reliable funding. A solid base of respected researchers at the station can also help identify sources of funding and support.

Strategic planning is a good method of enhancing station operations since it identifies and guides the implementation of solid development options (Whitesell, 2002, pp. 55-64). The long-term benefits of expanding infrastructure should be examined. A donor organization may contribute funds to the construction of a building, but if the donor loses interest in the station a few years down the road, the

station must still bear the costs of maintenance. The implementation of strategies for attracting donors requires state-of-the-art telecommunications, such as that of the Internet.

Lohr and Stanford argue that it is now time for field stations to establish links with one another and form a network that can meet the needs of the future with their combined strength and resources (1996, p. 1). Additionally, recently funding for field biology has become constrained, ecosystems are disappearing, and facilities are getting more expensive. The general consensus among authors is that the proximity of field stations to a natural environment provides a distinct advantage over studying in an indoor laboratory. Also in wide agreement is that these stations should devote research to the prevention of ecosystem destruction. .

Lohr and Stanford further suggest that a network of field stations would facilitate the exchange of information that is critical in furthering basic biology and resource management efforts. Additionally, a network can help in the evaluation of methods for sustaining healthy ecosystems. The network provides long term data for quantitative evaluation of national or global environmental conditions. As research fields have spread across the U.S., progress has been made in creating such a network. Indeed, funding is easier to obtain as resources are shared and services are amplified throughout the network.

2.4.2 Financial Planning / Growth

The most important concept in any sort of project funding is convincing the potential investors of the project that the returns will be greater than the risks. The owner of the business, or entrepreneur, should be willing to provide his own initial funding for the project, e.g., research facility (Clifton, 1977, p. 291). If, however, he

is unable to set aside the initial sum of money required to start the project, he should seek outside sources such as debt financing or equity. Also, various legal aspects should be examined, such as organization requirements, costs, liability of owners, continuity of the concern, transferability of the interest, management and control, attractiveness for raising capital, and tax treatment (Clifton, 1977, p. 293). Examination of these elements is necessary in order to avoid corporate breakdown of the research center or legal conflicts.

Funding, for a non-profit organization such as a research center, can be best achieved through multiple ways. The primary method is through major donors. The trustees should set the primary guidelines by which donors contribute (Wolf, 1990, p. 198). Specifically, funders need to know the answers to several questions: What percent of trustees are contributing to an organization? (Ideally, all should contribute.) How much does the organization receive in board contributions? How active is the board in soliciting funds? The trustees of the organizations must be the leaders which give generously to the organization themselves. Ordinary people donate or contribute to an organization when they believe this act will make their lives better (Flanagan, 1995, p. 89). Thus, asking for money for an organization from people should be done with enthusiasm, and possibly through volunteers from the organization, either by direct mail or in person. In the case of LBG, which has enormous potential and growing strengths, the World Wide Web would be most beneficial in attracting donors from all over the world.

An individual donor program is useful when the number of donors giving unrestricted funds is increased on an annual basis, and when the amount that each individual donor gives is upgraded from year to year (Wolf, 1990, p. 200). The more personalized the approach of the board of trustees to ask for contributions, the more

likely the chance of success. For example, telethons are a good method of solicitation. In an individual donor program, each donor determines his or her own contribution based on personal criteria and sense of commitment to the program or organization (Flanagan, 1995, p. 94). A major donor campaign should also be planned out by two or three paid staff members. This campaign should include the goal of understanding what donors to ask, what guidelines are needed to ask for contributions, identifying prospects to whom the donors can relate to (e.g., people who have contributed before), and a system that acknowledges donors who contribute on a regular basis. Thus, to ensure growth and expansion of any organization, including LBG, support by a broad base of donors and enhancement of the contributions through major campaigns is essential.

Another source of contributions is from local businesses, which can provide unrestricted income (Wolf, 1990, p. 209). Usually, a business's contribution is in the form of membership. More than likely, each individual business will make a very small contribution; however, if there are many of them, there can be a significant source of revenue. For example, a supermarket may contribute food towards fund-raising or a bank might contribute some advertising space in the newspaper to help promote an event. For larger gifts, corporations may be the key (Wolf, 1990, p. 213). Usually, the donations from large corporations are somehow related to a business interest since corporations are for-profit organizations. For example, a corporation may contribute to LBG in order to influence public opinion about itself, benefit its employees, or help its marketing efforts. Hence, it is extremely crucial to find out precisely what is behind a corporation's contributions policy before a proposal from the non-profit organization is submitted.

Finally, foundations and government agencies are other important sources of larger restricted grants (Wolf, 1990, p. 217). To obtain a list of foundations that can contribute to a non-profit organization, the Foundation Center's regional collections can be consulted. These are reference centers which have an extensive array of foundation annual reports, newsletters, and foundation tax returns. Searching for government funding is more difficult (Wolf, 1990, p. 217). The important object of the search is locating potential sources of grants. Certain catalogues can be found which contain information on every federal funding program with program objectives, types of assistance, uses, and restrictions (Wolf, 1990, p. 217). The best method of obtaining grant information, however, would be by talking to other non-profit organizations to determine where they normally apply for money. A national service organization in the area of expertise and public officials are also excellent parties to obtain input from.

2.4.3 Capital Campaigning

One example of a successful nonprofit organization's capital campaign is that of the California Museum of Science and Industry. The board and professional staff decided in 1989 to become the science center of the future (Hoyt, 1998, p. 1). To accomplish the capital campaign, the board took the following steps. First, campaign staff were recruited from inside and outside the institution. Second, available resources were analyzed and utilized. Between 1992 and 1998, the center raised $32.9 million, overshooting its goal of $29 million. In order for a capital campaign to be successful at LBG, the depth of the annual fund donor base, volunteer input from the local community, and the strength of the internal database, research, and staff

infrastructure must all be examined. More resources are necessary to meet emerging needs (Kenworthy, 1994, p. 57).

The California Museum of Science was committed to rebuilding 600,000 square feet of its infrastructure, as well as designing an elementary school, after a devastating earthquake damaged two-thirds of the exhibition space (Hoyt, 1998, p. 2). No other project in the U.S. included such a combination of both informal and formal science facilities in one site. The purpose of the capital campaign was to convey a vision; the institution had a single voice and knew where its strengths lay. The first question to be asked was "What part of the organization's vision will be articulated today?" A powerful, committed leadership was the basis of the campaign. Thus, planning and team building had to be the first campaign phase. Most of the staff consisted of members who had substantial prior experience with marketing and fund raising. These lessons of leadership and vision at this science center can be applied to LBG as well.

Additionally, a state-funded masterplan had been drafted to re-envision the institution in 1988 (Hoyt, 1998, p. 3), similar to LBG's. Former and potential donation lists were compiled as well, a task LBG has yet to complete. Resources were allocated, meaning funding was planned in terms of what areas of the museum money would support. Each donor prospect needed to know what his or her contribution would accomplish. Ad hoc committees were formed to help develop a roster of potential campaign leaders. A high volume of working reports and tailored campaign materials were developed, which modeled the new infrastructure of the science center. A focused, highly trained staff was crucial in garnering the support and resources necessary for a successful campaign. The values of the organization

were the core concerns and goals shared by most of the people in the group, and they tended to shape group behavior (Cook, 1998, pp. 35-37).

There are several aspects to leadership growth at any organization such as LBG. The first relates to the professional area in which the manager functions (Cook, 1998, pp. 35-37). The manager must stay in touch with his/her own specialist area. There must be continuous professional development. A manager must acquire an initial understanding of the principles, practices, and competences of running the organization, by applying his or her own knowledge and then gaining new knowledge from experiences. The manager should be able to adjust his or her approach, decisions, and actions to the process. In terms of financing, it is possible that creation of a permanent endowment may help increase resources (Kenworthy, 1994, p. 57).

To determine the feasibility of support for an endowment among membering institutions, several steps need to be followed. Interviews and surveys need to be conducted among these supporting institutions to understand if there is support and willingness to be part of the Capital Campaign (Kenworthy, 1994, p. 57). Also, the board members need to work on a "case" for giving and determine several areas into which resources should be channeled. Usually these areas include Leadership Development, Strategic Research, Innovation, and Public Outreach (Kenworthy, 1994, p. 58). During the feasibility study, the amount of each gift and number per gift needs to be understood. Campaigns need to recognize their donors by, for example, naming buildings for which they have contributed, in order to create enthusiasm among top prospects.

Recognition plans developed with prospective donors give them the opportunity to tell the organization what they want and increase the probability that they will support the campaign (Kenworthy, 1994, p. 95). For example, printed

recognition in journals or annual reports, plaques, and rebates are all considered recognition. Keeping all volunteers informed and involved in the campaign is also important in building support.

Strategic planning is defined as a formalized process by which an organization makes a study of its vision for the future, usually for the next several years. This is an important management tool for organization leaders to consider the effects of advances in technology, changing markets for its services, changing sources of funding, or competition with other similar organizations (Whitehat, 1999, p. 39). Strategic planning at LBG can be used to coordinate activities, ensure that the future is taken into account, and to be rational and control the organization's destiny. It suggests remedies for problems in the organization before they become too large to handle. Periodic planning allows the organization to identify and assess its possible future threats, and thus has an opportunity to respond to them. It also provides a priority assessment of the LBG masterplan.

Strategic planning is also important to the growth and external recognition of a nonprofit organization such as LBG (Lakey, Napier, et al., 1995, p. 107). A framework and plan helps define an appropriate method by which the organization can grow to full strength. In this framework, the mission statement of the organization must be clearly defined. A vision must also be created, to identify where it would like to be in several years given its resources and capabilities. Whereas a mission identifies the standard with which the organization is performing presently, a vision is a guide which the organization will need to achieve success in the future. Additionally, the organization's relationship to its environment must be analyzed (Lakey, Napier, et al., 1995, p. 112), meaning that the progress of its peers must be compared with the organization. Finally, the overall plan needs to be implemented

through supervision and support, re-evaluated through constant data-gathering, and re-examined through various surveys sent to the organization's audience.

Integrated planning, or planning that is integrated into the regular operation of the organization, requires every detail in the planning process to influence one another (Wolf, 1990, p. 249). Integrated planning is normally used when the organization needs to move quickly toward an action, or when the board, staff, and constituency all need to remain involved in the planning process in an ongoing way. Linear planning, on the other hand, assumes planning is initiated periodically at different points in the organization's history, and that it has a beginning and an end point. This form of planning can be carried out to create new organizations, perhaps within older organizations, and is normally used when considering a departure from certain previous policies or a change in direction. Depending on the complexity of LBG's masterplan goals, integrated planning may be necessary.

Indeed, strategic planning requires an investment of money and time, usually the hiring of an outside consultant, many meetings, and involves board members and other stakeholders (Whitehat, 1999, p. 40). At LBG, consumer satisfaction, community benefit, and image in the community would be considered most important in the planning stages. The primary motivations for strategic planning include pressure from board members, the desire to attract more funders, organizational crises (such as retirement of a leader), or opportunities to restructure the organization. The benefits of planning include proactive discussion of issues, brainstorming, and setting a broad set of values. Also, it forces proper allocation of resources to respond to changing conditions, and obtaining more resources. Furthermore, strategic planning fosters relationships and partnerships with external organizations that might not exist

otherwise. It also allows the board, staff, and agency stakeholders to become more informed about activities and problems faced by the agency.

It would be useful to have a trained consultant at LBG to assist in the planning process, meetings, cost, and timing (Whitehat, 1999, p. 43). The basic steps involved in developing a strategic plan include building an infrastructure, deciding the timespan in number of years that the plan should cover, and allocating funding. Anthony and Herzlinger (1975, p. 28) describe strategic planning as based on trial-and-error and informal decision making. Strategic decisions are made only occasionally and arise during need. The management control system collects information that is useful in strategic planning (Anthony & Herzlinger, 1975, p. 28). The two major aspects to planning include "scanning the environment," which identifies problems, and the actual program, which serves as a benchmark in judging strategic proposals. The programming process takes goals of the plans and identifies programs that will implement them efficiently. Strategic planning frequently includes many of these programs that are crucial in obtaining goals.

Wilson Botanical Garden provides an example of a successful garden's planning strategies. In 1988, Wilson's operations and programs were opened to review (OTS, 1988, p. 7). A committee was appointed to evaluate the state of the Garden and make recommendations concerning its future. In the report to the directors, a rationale was provided for the Garden and programs supportive of this rationale were outlined. Most of the programs were geared to the issues of conservation. The potential for Wilson to serve as a model for the development and expansion of other similar botanical gardens is acknowledged by OTS. OTS has noted that it is committed to the successful development of Wilson, refurbishing its plantings and rebuilding its physical facilties (1988, p. 7). The Garden has been able

to gain recognition in cultural, economic, and educational areas by the people of Costa Rica, and the government is quite interested in the garden.

Once an organization such as LBG is able to obtain adequate funding, it must develop strategies to understand its management structure and future growth pattern (See Appendix M).

2.4.4 The Prospectus and its Values

The prospectus is essential in the marketing efforts during a capital campaign. It is basically a campaign brochure which is a major promotional piece and case statement for the campaign (Kenworthy, 1994, p. 60). The prospectus must project a first-rate image of the institution which it markets, in addition to showcasing leadership and progress in the major funding areas. Additionally, it is important to use high-quality paper, multi-colored pictures, and simple yet attractive graphic presentations. This brochure is mailed to all campaign prospects, including a personal cover letter from the campaign leaders asking them to invest in the future of epiphyte research and taxonomy.

Upon sending each letter and prospectus, a volunteer is notified and asked to follow-up via telephone call or supporting letter within a few days (Kenworthy, 1994, p. 88). This internal phase of the Capital Campaign is crucial in securing leadership gifts before the organization publicly announces its desires to raise funds. The internal phase also requires much recruitment and support of volunteers. Top prospects, which include foundations and other associations, can provide key gifts early in the campaign which can raise sights of the organization to an enormous extent.

The actual campaign launch should catch the attention of as many constituents as possible (Kenworthy, 1994, p. 88). Thus, somehow the number of pledges received needs to be displayed, and those who provided support early in the campaign need to be recognized. Additionally, an incentive must be provided to others who make significant gifts. One example of this incentive, as stated by Kenworthy, is the construction of a 10-foot-high pyramid, encased in plexiglass, with 84 spaces for donor logos. Each founding contributor was allowed to light up his/her organization's name on the pyramid publicly, acknowledging his/her support.

2.4.5 Marketing and Promotion through the World Wide Web

A market is a set of potential future customers and current customers of a service (Cooney et al., 2000, p. 26). A "divide and conquer" strategy is used to analyze the market to determine proper targets. Non-profit organizations, such as the LBG research center, need to identify a primary target audience as the focus for a marketing campaign. This will optimize their advertising efforts. In a research facility such as LBG, visiting researchers, individual major donors, students, and ecotourists would be the key audiences.

A marketing plan must be developed in order to attract the primary audience. One effective method stated by Cooney et al., (2000, p. 31), used by many non-profit organizations, is the World Wide Web because it is inexpensive and has a vast audience. According to Rados (1996, p. 166), in order to advertise its strengths, the non-profit organization must be skilled in analyzing its own strengths and weaknesses so that it will be aware of the reputation it has in the minds of its audience. Regardless, important goals of the marketing campaign should include finding

individuals who will bring immediate attention to the non-profit organization, as well as establishing partnerships with sponsoring organizations.

The World Wide Web can be accessed by establishing a website. A web site is able to disseminate an organization's strengths, potentials, and future plans to anyone who is connected to the World Wide Web. For example, the INBio website receives approximately 12,000 visits per day, according to Mr. Eric Mata, director of information management. There are also "backup" sites at University of Alberta and at Missouri Botanical Gardens. Initially, the webpage was organized to reflect the organizational structure of INBio. However, the website now displays content that is in most demand by INBio's audiences; i.e., tourists, researchers, and students. For example, 85% of the visits occur at the taxonomic database, thus the appearance and navigability of this particular section is well-maintained (Mata, 2002). It is important to maintain a context to the pictures and displays to add to the aesthetics of the overall webpage. The value of the information on the webpage is regularly examined, and a yearly report is published for potential partners and funders. This last section is important to attract interested members and partners. Some important elements in a successful botanical website include the number of species of the various collections, regulations of conducting research, a web-based guide, and weather data (Matlock, 2002).

Other organizations' webpages can provide information on the best content and layout of its own potential webpage (Dickman, 1995, p. 56). The actual implementation can take place either by the organization's own staff or through the hiring of a consultant. It is recommended, however, to seek external consultants in this process. Many consultants provide guidance free of charge if the organization has a large annual income and has completed previous preparation in web design.

While some have stated that the best preparation for the creation of a homepage is to browse other websites of similar organizations, Raward adds to that by stating that the website requires an interface that can accommodate the different needs, disciplines, and capabilities of all the users in the institution (2001, p. 1). The primary users include those within the environment hosting the webpage. The secondary users include outside institutions with similar goals. The design of a simple evaluation method is necessary in developing user-friendly websites (Raward, 2001, p. 3). Usually, a checklist is developed for website designers for maintenance. The questions are regarding finding information, understanding information, supporting user tasks, and presenting the information to the audience. An evaluative tool is essential to ensure the best design practice principles in the website (Raward, 2001, p. 7).

In 1994, the number of web users was 2 million. Since then, this number has increased dramatically. This has turned the web into a true commercial network (Dickman, 1995, p. 56). The web is much easier to use than a conventional computer network since its use consists of typing a web address into web browser software. A website can contain the organization's postal address as well as a description of the various services offered by the organization. The most important virtue of a website is the linking of information, which allows a user to click on an item and bring up another page such as a form for contributions. This hyperlinking allows a user to view related topics within and between sites. This capability gives the web an advantage unrivaled by brochures (Dickman, 1995, p. 56). The main challenge of organizations who have webpages is, however, to turn browsers into those who use the services and programs offered by the organization (Dickman, 1995, p. 56). Many times, a webpage is based on the company's marketing brochure.

Several hints in hyperlinking pages are important, according to Raward (2001, p. 3). For example, there should be a link connecting all of the site's pages to the homepage. Also, there should be text identification of the graphics on each page, and each page should finish above a certain point so the user is able to see it on his/her computer screen. There should also be limited use of graphics, clear navigation, scannability, and the pages must look consistent throughout.

The cost of establishing a presence of the web is relatively small. Furthermore, the web is socialist in the sense that both small and large organizations have the ability to present their information on an equal playing field. According to Dickman (1995, p. 58), the Web can be a powerful tool in reaching potential constituents of the organization even compared to e-mail. A website can also be used to find investors. Furthermore, major assets of the web include accessibility from anywhere and its ability to generate large amounts of information organized into manageable pieces. The information on a webpage can give prospective users of the organization's services and programs a reason for using them. The webpage is used to give users an understanding of the advantages of the organization's services and programs. Also, the users should be involved more fully in the design and development process of websites of research or education institutions (Raward, 2001, p. 2).

Location of a website is important in attracting potential users. A "web mall" is important in creating a consortium of websites that present organizations with common interests (Dickman, 1995, p. 58). Occasionally the website's internet service provider is important in attracting visitors to the website. If the internet service provider has limited experience with the Internet, then it is less likely that the organization with that provider will attract many users (Dickman, 1995, p. 58).

"Marketing" is defined as the continuous diagnosis and analysis of the changing needs of customers, clients, and constituents, and devising strategies to meet these needs (Wolf, 1990, p. 117). It requires creation of an appropriate vision and image for the services offered by an organization. Particularly, in the context of nonprofit organizations, marketing is the engineering of satisfaction among a variety of groups who utilize the services offered by the organization. Successful marketing allows organizations to accomplish their missions, meet program goals, and achieve long-term financial security by satisfying those who use their products and services.

Several tasks must be completed when marketing an organization. Market segmentation allows the organization to identify the constituents, or those who will use the organization's services. The constituents need to be carefully analyzed and listed, for there are always many hidden ones. Also, the image of the organization must be analyzed and enhanced. Image is defined as the sum total of beliefs, ideas and impressions that people have of an organization or the programs, services, or products it offers (Wolf, 1990, p. 121). A strong image for a nonprofit organization is crucial in gaining clients, students, or an audience, as well as donors and community support.

Overall, there are four important elements which are pivotal in determining whether an audience decides to buy a product, purchase services, pay for programs, or make a contribution to a nonprofit organization (Wolf, 1990, p. 127). The first is the programs and services offered. The second element is the promotion of these programs or services. The third is the cost of participation, and the fourth is the place in which the services are available. The goals of nonprofit organizations are not rigorously to develop and test products as for-profit organizations, but to educate consumers' tastes and preferences. Nonprofit organizations can promote themselves

through free media coverage, through organized word-of-mouth campaigns, or through presentations at conferences. Nonetheless, the nonprofit organization must not oversell or exaggerate its services, and it must market itself according to expectations by its constituents.

In summation, Lankester Botanical Gardens must seek out funding and new ways of marketing in order to fully develop its capacities as a research and educational institution. Large donors are normally identified through ties to the organization which can be initially pursued through a prospectus, and a webpage on the Internet is important in attracting people who will contribute at all levels of funding. Foundations and ecotourist corporations can be important contributors to botanical research centers. A webpage that portrays LBG's strengths, resources, and potential will reach a wide public.

Chapter 3. Methodology

3.1 Introduction

The following methodological procedures describe how we obtained input from various organizations and individuals about LBG's current visibility and services and LBG's future potential as a research and educational institution. Using those data, we designed a prospectus and website to include information about both current and planned services of interest to similar research centers and organizations, funding agencies, and prospective clientele. We surveyed representatives of three groups, namely researchers, philanthropic organizations, and academics. These three groups were chosen because LBG's services and programs are directed to these groups the most. Thus, in order to improve LBG's services, it will be important to understand what they desire from LBG in the future before initiating the Capital Campaign. Additionally, we interviewed staff members of other botanical centers to learn how they achieve public attention, funding, and fulfill their organizational goals. Finally, we surveyed and analyzed other botanical centers' websites to get ideas on the most appropriate content and organization for LBG's own website. The overall goal was to ask various audiences about how LBG could become better known among researchers as well as the wider public, particularly through a prospectus and an enhanced website.

3.2 Determining Partner's Needs

The first step in developing a prospectus for LBG was determining what services and programs were most sought after by various, potential collaborators, including researchers, organizations, and academics. This was done by surveying a selected

number of people in three groups who might be interested in reading the prospectus and who might potentially benefit from partnering with LBG. We preferred a semi-structured survey, through email, because we were able to receive open-ended input from each person through open-ended questions. This open-ended correspondence between us and the respondent included strengths and weaknesses of LBG, a description of what services are strong and why, and a description of what services are most important for the future success of LBG. Email was the mode of communication because most of the contacts were located outside Costa Rica.

We received a list of relevant international researchers through Jorge Warner, executive director of LBG. This list was compiled mostly from institutions and researchers who had previously collaborated with LBG either through research or ecotourist activities. For example, some researchers included people who had published in *Lankesteriana* or were Ph.D candidates who had completed some of their research at LBG. Since these researchers already had a prior connection to LBG, we had a better assurance of being able to hear back from them. The contact information of each person on the list, which included email information, was obtained from the World Wide Web. There were eleven individuals. The survey questionnaire was sent out to each person via email attachment and was also located at the URL, http://users.wpi.edu/~r_mazum/iqp/research.doc (See Appendix H).

Additionally, we received a list of philanthropic organizations from Jorge Warner, compiled mostly from benefactors who had either funded LBG when it was first founded, or funded its activities since then. Additionally, any other organizations that had visited LBG in the past were included. Most of these organizations were orchid preservation or

ecotourist societies who share LBG's goals of orchid conservation. The contact information, mostly fax numbers, was obtained through the web. There were four organizations, one of them containing three committees, each of which received one questionnaire (see Appendix I and J). The survey form was sent, also via email, to an individual in the organization who had the most knowledge of LBG. This survey was also located at the URL http://users.wpi.edu/~r_mazum/iqp/lankester.doc . The questions directed to this group were geared towards understanding the conservation aspect of LBG's services. For example, they were asked to describe how LBG could better promote epiphyte and orchid conservation, as well as ecotourism. Thus, the questions asked of this group provided input not only about the research activities of LBG, but also about public outreach activities.

Overall, the questionnaires contained nine short-answer questions that asked each respondent about LBG's strengths and weaknesses and whether they were aware of its current masterplan for the next decade. Then we asked several questions in which the respondent was asked to comment on and discuss LBG's activities and services. These services included areas in which LBG is currently active and attempting to enhance. We also asked them to discuss what they believed were the most important areas needed to be improved at LBG. Finally, we asked them to discuss their interest in forming a close partnership with LBG, and, if they were interested, what programs and services would they most like to participate in. The questionnaire was revised with input from Professors Peet and Addison, Jorge Warner, and Prof. Franco Pupulin, researcher at LBG. Additionally, Jorge Warner and Franco Pupulin were informally interviewed to

understand how they perceive their own institutions strengths and weaknesses and what are the essential features of the masterplan.

Finally, with the Escuela de Biologia and the Facultad de Microbiologia, at the University of Costa Rica, we conducted a focus group with biology and botany students in a classroom setting. We identified one professor who had participated in the 2001 Mesoamerican Seminar on Orchidology and Conservation, and we asked if we could speak to some of her students regarding LBG. A focus group in this context was used to receive input on educational program plans of LBG in an open-ended, discussion format. The focus group contained approximately ten to twelve students with one of us serving as moderator. The questions we asked the students were more or less in a "roundtable" format. They were asked if they were aware of LBG and its activities, as well as what services and programs they would like to see offered to students with their background and interests. They were also asked to discuss LBG's visibility and current outreach to students, as well as what activities, such as expeditions or educational programs, they would most desire to see at LBG (see Appendix B). Furthermore, they were read the educational plans of LBG and asked to prioritize what areas would be most interesting or useful to them.

All the information from the surveys and focus group was compiled and analyzed using content analysis. We determined the most desired improvements in the masterplan indicated by the respondents and the strongest programs which would enhance LBG's visibility. Finally, a correlation was made between LBG's *actual* plans, strengths, and weaknesses and LBG's *perceived* plans, strengths, and weaknesses. This information was used in conceptualizing the prospectus.

3.3 Understanding Development and Marketing of Other Centers

In the preliminary stage of the IQP, we sent emails to the directors of several botanical gardens to understand how they had developed from their beginnings. Our model research centers included Kew Botanical Gardens, Marie Selby Gardens, Belize Botanical Gardens, and the Harvard Herbarium. These centers were chosen as models because they had received some degree of international recognition as major centers for botanical research and achieved the sort of visibility that LBG seeks. The centers were asked about how they have marketed themselves, how their services and activities were promoted, and how they had obtained adequate funding. The directors responded by email with an open-ended description. We also interviewed Professor Ron Cheetham from WPI to gauge his opinion about LBG, any partnerships that are currently underway between WPI and LBG, as well as any important elements that are required in the development of a full-scale research center in order to maximize partnership opportunities.

Interviews were conducted with four knowledgeable staff members at three other Costa Rican botanical research centers in order to obtain in-depth information on how the center had obtained funding and support to grow into a prestigious research center. (See Appendix C-F.) These staff members were Dr. Julio Clavo, executive director of Centro de Ciences Tropicales, Eric Chaves, general manager, and Eric Mata, director of information technology, both of INBioparque, and Robert Matlock, director of research at La Selva. The primary question asked was what their current situation was in terms of research activities and services, how they grew from the beginning until the present, what plans they have for growth, and what they thought were the best means of gaining public

attention and support. Specifically, Eric Mata, director of information management of INBio, was interviewed to obtain information about the INBio website in terms of how it has been developed and how it has marketed INBio to prospective partners. Also, we learned about their masterplans and how these institutional objectives were projected to the public through prospecti and websites. This analysis was crucial in serving as a model for the future development of LBG's initiatives to reach to a wider public. The interview results among institutions were compared and applied to LBG. Also, we obtained copies of public documents detailing their growth strategies, and any information about how each center developed a website to disseminate its strengths, as this is a crucial feature of LBG's masterplan. We also asked general assessments of various LBG research activities and programs.

3.4 Analysis of Documents: Development of Prospectus and Website Outline

In order to define and develop the prospectus, the documents, interview data, and feedback from the various audiences were analyzed. The primary source of the prospectus is LBG's masterplan, organized through feedback from the constituents. A sample prospectus from Marie Selby Botanical Gardens, Department of Research, was also analyzed to determine appropriate organization and relevant content of LBG's prospectus. The analysis of the eight other websites provided an outline for LBG's website.

We surveyed and took notes on the content and organization of other botanical centers' websites in order to understand what is appropriate on LBG's own pages. We investigated the various layouts of these eight websites. The list included Royal

Botanical Gardens, Kew (http://www.kew.org), Royal Botanical Gardens, Edinburgh (http://www.rbge.org.uk), New York Botanical Gardens (http://www.nybg.org), Cleveland Botanical Garden (http://www.cbgarden.org), Missouri Botanical Garden (http://www.mobot.org), Marie Selby Botanical Gardens (http://www.selby.org), Australian National Botanical Garden (http://www.anbg.gov.au/), and Chicago Botanic Garden (http://www.chicago-botanic.org). Additionally, we investigated the layout and content of the Capital Campaign webpage of Worcester Polytechnic Institute (http://www.wpi.edu/Campaign) for ideas in a similar webpage for LBG. Their websites were studied and examined, and a list of the most common concepts displayed and a pictorial organization was developed. Information from the LBG prospectus was then used to develop some areas of the proposed website, including a link to "Capital Campaign."

To develop a draft for the LBG prospectus, we needed to understand LBG's current strengths and future development plans according to its researchers, input from other botanical research centers, LBG's collaborators (i.e., people and organizations who will be reading LBG's prospectus, or the audience of LBG's services and activities), and analysis of other information from successful botanical research centers. We also studied important content and the overall organization of the Marie Selby prospectus to understand the most relevant information to include in LBG's prospectus. We also made recommendations for future plans to Jorge Warner and placed them accordingly in the prospectus. Jorge Warner, Franco Pupulin, and Walter Schug, a friend of LBG who is planning on working on a database and website, provided input for the best format for the prospectus and the website outline. The prospectus was drafted keeping the various

constituents – those who will benefit from LBG's services – in mind. This prospectus will also need to be distributed as a brochure-like hardcopy to current LBG collaborators and institutions to attract more researchers and funders for a future capital campaign. The website will be implemented so that organizations and researchers from around the world can browse its content.

Chapter 4. Results & Analysis

4.1 Introduction – Needs of LBG's Audiences

After completing our methodologies, we developed an appropriate format for the LBG website and prospectus. The website's outline and layout were based on our visual analysis of eight other prestigious botanical garden websites. The prospectus was drafted based on the masterplan as well as the needs of those we surveyed. The needs of the constituents were used to decide what aspects of the masterplan need emphasis. The analyses of the responses has been qualitative as opposed to quantitative. (All respondents will be referred to as "he" or she" on the condition of anonymity.) Of the eleven researchers surveyed, three responded and two refused. Of the four foundations surveyed, one of the committees and one foundation responded. However, one of the researchers who responded and the committee claimed to have no awareness of LBG's programs and services.

Of the two researchers who were aware of LBG's services and programs, both indicated that additional programs LBG could implement to make it more attractive to them would be conservation programs, either for grade-school teachers or through scheduled talks to local orchid conservation organizations. Both of the researchers are taxonomists. One of the researchers keeps in close contact with the staff at LBG and is well aware of its plans for development. The other researcher is aware of some aspects of LBG's research but is not aware of any plans.

In terms of strengths, the researcher with closer contact indicated that "the extensive living collections of native Costa Rican orchids is unrivaled by any other institution. Its geographic location [at] a middle elevation site near the geometric center

of the country provides easy access to most field sites, as well as a convenient climate for the cultivation of most orchids." This suggests LBG's tremendous potential as a conservation center, especially if other collaborators are made aware of the resources of both Costa Rica and LBG. One of the researchers surveyed also indicated the Orchid Identification Center and propagation lab at LBG are major strengths, but they have not been publicized enough. Also, both researchers regard the *Lankesteriana* journal and *Epidendrum* newsletters as high quality publications and excellent vehicles for promoting and disseminating LBG's research. The LBG sponsored conferences also seemed to be gaining in frequency and size, in their opinions, which is another positive sign.

In terms of potential improvements, both researchers mentioned that the University of Costa Rica was financially restrictive in its administration of LBG. This perception of financial restriction may have actually caused potential funders and partners to turn away. Also, one researcher stated that LBG should not be so isolated, and, in particular, it should become more involved with the University of Costa Rica's Department of Biology. He also mentioned that "Research Associates" should be nominated from other institutions to promote partnerships, publications, and image. The minimal number of staff and researchers at LBG limited its research capabilities and opportunities.

Overall, one of the researchers indicated that the journal *Lankesteriana* could use better reviewing for publications in the field. Also, one researcher indicated that a taxonomy database system may not be a top priority because of the current size and sophistication of living collections; the cost to update and maintain a database may be too high. Also important for these researchers is the need to expand LBG's research scope to

include epiphyte regeneration, of which there currently are not very many projects. Conferences, an Internet website, and the construction of research facilities (such as an orchidarium or herbarium) were all given very high priority by these three scientists.

Only one philanthropic organization that responded was somewhat aware of LBG's services. The other one that responded was not aware of any of LBG's services, but provided a document explaining its expectations of potential orchid partners. (The former will be referred to as organization 'a', and the latter as organization 'b'). Both organizations listed artificial propagation of seeds as high priority. Organization 'a' stated they "would be willing to work with [LBG] in the form of some type of monetary grant to help get their seed flasking program started." In other words, they indicated an interest in LBG's sales of native Costa Rican orchids to their members. Neither had any experience with LBG's ecotourist services. Organization 'a' had an interest in LBG but cited its lack of communication as a major weakness. It also rated LBG's collections and displays as "above average." Organization 'a' was, furthermore, interested in orchid collection expeditions, conferences, and conservation lectures at LBG.

The focus group with botany students at the University of Costa Rica generated several ideas about LBG's potential services. Most expressed an interest in a greater number of volunteer opportunities. One student was interested in orchid hybrid studies as well as field expeditions for collecting orchids. All agreed that future LBG courses need to have intensive field studies associated with them. Furthermore, most expressed a desire to see more information archived and epiphytes showcased better, so that all students can understand orchid and epiphyte species at LBG.

4.2 Website Outline Development

4.2.1 Developing LBG's Website Content

Categorical data from eight botanical garden websites were compiled and placed into the most important thematic categories. These thematic categories, along with the websites from which these were obtained, are found in Table 4.1 below:

Table 4.1 Common Categories Among Websites

Key: Aus: Australian National Botanical Gardens
Mobot: Missouri Botanical Gardens
Chicago: Chicago Botanic Gardens
NY: New York Botanical
MS: Marie Selby Botanical
Clev: Cleveland Botanical Gardens
Kew: Royal Botanical Gardens, Kew
Eden: Royal Botanical Gardens, Edinburgh

"**Press – what's new**" – all except Aus.

Events

Calendar of events – Mobot, MS, Chicago
Weekly events – NY, Aus
Upcoming events – Chicago, MS
Family events – NY
Special events – NY, Clev
Events diary – Kew
New events – Kew, Eden, NY
Monthly events – Clev, NY

About us

"Who we are" – Kew
Garden overview – NY, Clev
The gardens – MS
Founder – Mobot
History – Chicago, Aus.
Vital Stats – Chicago
Staff – Aus.
Mission – Eden, Kew
Goals & Objectives – Kew

Research

Projects – Mobot, MS, Aus., Eden, Kew
Applied Research – Mobot, Kew
Databases – mobot, aus, kew, NY
Info – Mobot, Ms, Aus.
Centers – MS, NY, Aus.
Wishlist – MS, Eden
Press – MS, NY
Library – MS, NY
Science – NY, Kew, Chicago (conservation & development)
Symposium – Clev.
Identification – Aus.

Education

Certificate program – Clev
Facilities / school – Chicago, Aus, NY
Library – Chicago
Plant info – Chicago, NY, Aus.
Programs – NY, Mobot, MS, Eden, Kew
Grad studies – NY, Mobot, Eden
Goals & Objectives – Mobot, Kew
Resources – Mobot, Eden
Opportunities (positions) – Mobot, Eden, NY (internships)
Kids activities – Mobot, MS, Eden, Kew, NY
Publications – MS
Environmental – MS
Wishlist – MS

Visitor Information

Admissions – Chicago, NY, Kew
Tourist Services – Chicago, NY, Kew
Directions – Chicago, NY, MS, Clev.
Membership – Chicago, NY, MS, Clev, Aus, Kew
Travel Program – Chicago
Donations – Chicago, Mobot
Weather – NY
General Info – MS, Clev.
Contact info – MS, Clev

Conservation

Habitats – Kew
Sustainable consv. – Kew
Collections – Kew, Aus, Eden
Science – Chicago

Newsletter – MS
Programs – MS
Restoration – MS
Center – Mobot

Friends of the Garden

Friends – Aus, Clev, Eden, Kew
Member/donors – Chicago, NY, Mobot, MS
Benefits – Chicago, MS
Events – Chicago
Gifts – Chicago

According to Dr. Eric Mata, director of information technology at INBio, an important component of a botanical garden website designed to attract potential funders and partners, is the vision statement and a "progress report" of the masterplan's implementation. Therefore, a link to this was included under "Capital Campaign for LBG." Similar to Centro de Ciences Tropicales, LBG must establish its priorities according to the goals set out in the masterplan and shaped by current expectations of its potential audiences. Both present and future activities under each link - conservation, education, or research - are meant to provide helpful resources to scholars, students, and orchid lovers who browse the LBG website.

After the categories of each website were obtained, the most common headings and categories were organized for LBG's website outline. Most headings and subheadings are organized to provide "links" to content that is important for one or more viewers (students, researchers, or organizations). There is also a page for "Capital Campaign" since this will be planned soon in attracting sufficient funding and recognition. The items under "Capital Campaign" were developed using the WPI Capital Campaign webpage categories as models. The most relevant categories on this webpage

were applied to LBG's campaign webpage. Table 4.2 below displays LBG's preliminary website outline:

Table 4.2: LBG Website Content Outline

About LBG
Contact Information & Staff Directory
Garden Overview
LBG Highlights & Fact Sheet
History, Mission, Vision
Masterplan
Prospectus

Visitor Info
Directions
Regional Information (about Costa Rica, and weather)
Membership Information
Admissions
Donations
Tourist Services
Contact Information

What's new
Press Release
Calendar of Events
Special Events
Events Diary

Friends of the Garden
Why Contribute?
List of Friends
Partnership Information (sign online)
Benefits of Membership
Donating to LBG
Shops & Services
Capital Campaign

Education
Goals, Objectives
Orchid Courses & Programs (p & f)
Graduate & Continuing Ed. (p & f)
Kids programs (p & f)
Information & Resources about plants
Educational Facilities (p & f)
Wishlist (endowed professorships, classrooms)
Opportunities (e.g. internships, volunteer) (p & f)
Environmental conservation programs (p &f))
Libraries (p & f)

Research
General Information
Noteworthy Projects
Centers & Facilities
Libraries (p& f)
Database & Idenification
Press & Publications
Wishlist
Applied Research and Science
Research for Conservation

Conservation
Collections (p & f)
Programs (p & f)
Newsletters (e.g. epidendrum)
Training for conservation
Useful links

Campaign for LBG
The Garden Today
How to Participate
Campaign Staff
A New Vision
Building the Center of Tomorrow
News and Progress

4.2.2 Developing LBG's Website Layout

Each of the eight websites was studied to obtain knowledge about its layout, organization, and aesthetics. In particular, each homepage was examined for style, spatial arrangement, types of photos or pictures, and any other interesting items. The most navigable and aesthetically pleasing aspects of each website were incorporated into the proposal for the LBG's website structure and organization. Please see figure 4.1 for The Royal Botanical Gardens, Kew homepage, and see Appendix N for the homepage of the seven other websites.

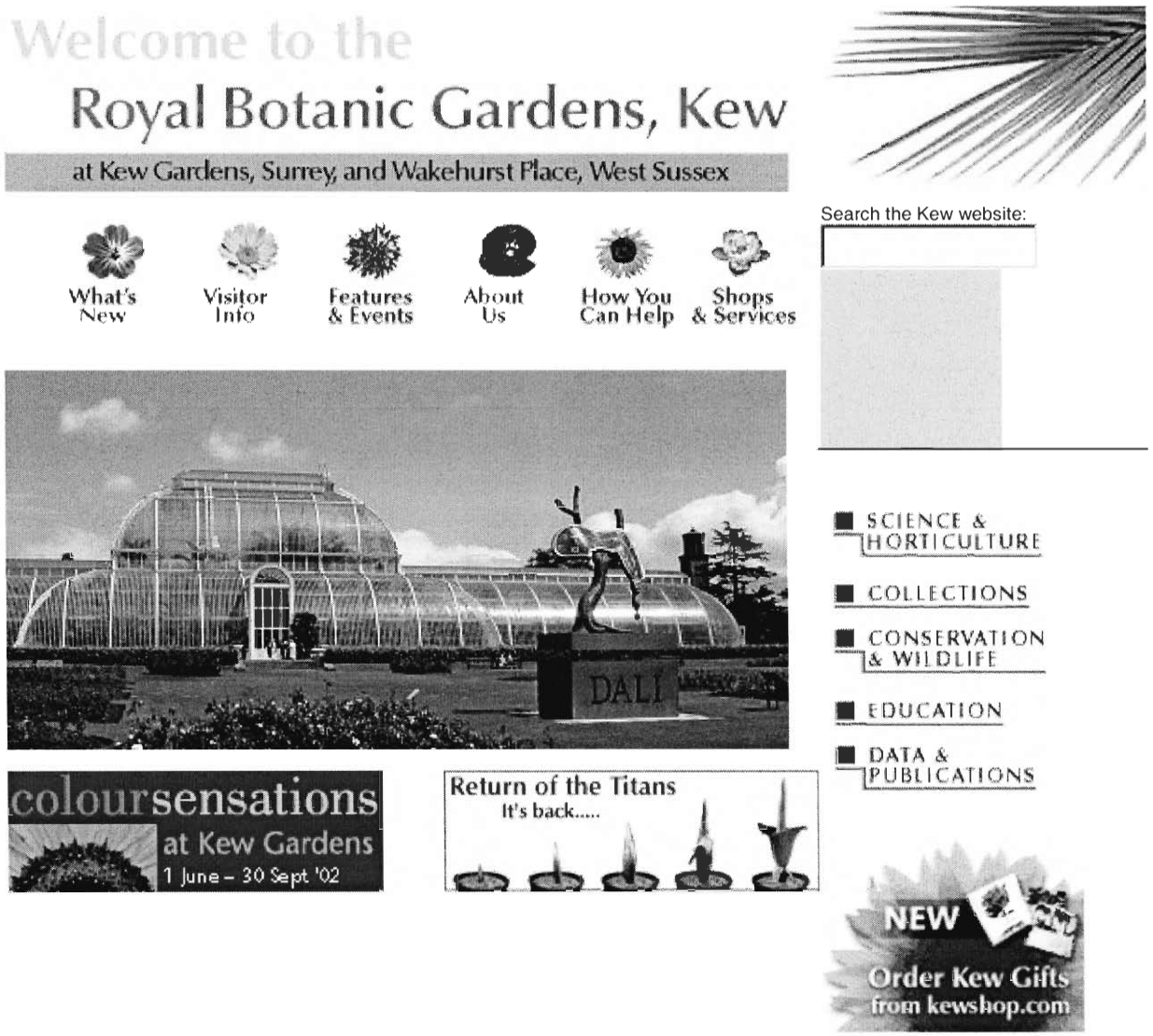

Fig. 4.1 Royal Botanic Gardens, Kew, Website Homepage (www.kew.org)

After the layout of each of the eight websites was analyzed, we eliminated the sites which contained the least aesthetic appeal or poorest navigability, namely Australian National Botanic Gardens, Royal Botanic Gardens, and Cleveland Botanical Gardens

(their content, however, was quite good, so they were used in the content analysis.) From the remaining six sites, we believed MSBG, MBG, NYBG, and Kew have the best aesthetic appeal and organization. This was because these homepages contained information in a compact way and contained pictures that added to the "mood" of each link. On Kew's website, for example, once each homepage link was clicked on, the links on the top shifted to the left and the links on the right moved to the top. Thus, LBG's homepage links were organized in a list fashion on the left. Each page under each main link contained further links also organized on the left. Similarly, Missouri's and Marie Selby's websites contained links on the left. However, the font needed to be bigger on Missouri. One noteworthy aspect on both Missouri's and Marie Selby's was a description of important events, along with pictures, on the mainpage. Additionally, both websites contained visitor information, directions, and membership information. Thus, the LBG website was taken into account, and basic pictures of different orchids were added to enhance the visual effect (see Appendix L for final website prototype). On the Capital Campaign page, the six links were placed in a rectangular format around the center to enhance a more "centralized" feeling of the campaign.

Feedback on the website content and layout was received from Mr. Schug. Based on his recommendation, a link to "Version in Spanish" was added on the LBG homepage. Certain categories were consolidated to allow easier navigability and readability. Furthermore, the length of the window was reduced by decreasing the number of links per page, and the depth of each link was taken into account. Finally, appropriate icons were added next to research, education, and conservation on the LBG homepage to show examples of such.

4.3 Development of the Prospectus

The LBG prospectus consists mostly of information taken from the masterplan, which was organized into a version that would be of interest to LBG's potential partners. The prospectus is designed to address the areas that LBG's potential partners feel are most important to its future success. It is important to include sections on future developments of LBG under each program section to emphasize the enhancements that are planned. These enhancements include the Orchid Identification Center, future conservation and training programs for grade-school teachers, and future plans for more diverse research projects in epiphyte taxonomy as well as new and expanded facilities. Additionally, the journals, conferences, and newsletters need to be emphasized. The journals and newsletters are described in full detail. Past conferences are outlined and future plans for more conferences are included as well as their purposes. (See Appendix K for LBG's prospectus prototype).

A research prospectus, created in Spring 1991, for Marie Selby Botanical Gardens was used as a rough template. The first section of this prospectus contained the goals of the research program, its virtues, a brief history, and the current major areas of research. The next section contained a description of the breadth of collections at Marie Selby. The third section contained a description of field and laboratory projects, and then a description of various facilities and centers. Next, a description of the library's collections is given. Then, scientific publications, education, a visiting scientists program, and events are described. Finally, a detailed description of Selby's research staff is given.

We formulated the LBG prospectus to reflect a similar organization of Marie Selby's prospectus by using the categories relevant to LBG. The title page of the prospectus contains contact information of the LBG staff as well as a mailing address. The first section of LBG's prospectus immediately states the major strength of Lankester Botanical Gardens: its unrivaled collection of orchids. A description of orchid collections was provided because one of the researchers surveyed indicated that "the extensive living collections of native Costa Rican orchids [at LBG] is unrivaled by any other institution." Also, according to Dr. Matlock of La Selva, most visitors come to La Selva originally because of its natural resource – primary tropical forest. Similarly, visitors will come to LBG because of the natural beauty and immense variety of orchids and epiphytes that can be seen there. It is important to begin with this section to immediately grab the attention of LBG's potential constituents.

The section also contains an overview of LBG, including its history and heritage, what makes it unique in orchidology and orchid collections, and what exactly makes it the best location for the Mesoamerican Center for Orchid Research and Taxonomy. Included in this section is the history of LBG, its mission, its vision, and its goals, to give an idea of what makes LBG unique. It was important to also have this section describe Costa Rica because, according to both Eric Chaves of INBio and Julio Chaves of Centro de Ciences Tropicales, much of the operating and marketing revenue comes from tourism. Thus, a positive description of Costa Rica, and the Cartago area in particular, will help attract more tourists and researchers. The section describes Costa Rica's climate, biodiversity, and the potential for international orchid research and conferences. One anonymous researcher surveyed explained that "[LBG's] geographic location [at] a

middle elevation site near the geometric center of the country provides easy access to most field sites, as well as a convenient climate for the cultivation of most orchids."

The second section entitled "Research" describes LBG's research activities. It is crucial to include research areas and topics that most of those surveyed identified as important. The current state of research facilities, centers, and programs are explained, as well as why they are significant. For example, the Orchid Identification Center and Propagation Laboratory are currently held in high esteem by researchers, thus they need to be emphasized. Important also is a description of the collaborative efforts with U.CR's department of biology. Finally, the library supportive of research activities is briefly described. Currently, the LBG staff is limited, thus limiting the areas of current research there. The garden is seeking researchers in many botanical fields.

The next section, "publications," contains information on LBG journals and newsletters, such as *Lankesteriana* and the *Epidendrum*. The description contains the goals, summary, and vision for each publication. It is important to stress publications because, according to those surveyed, they represent a valuable asset of LBG. Disseminating information about LBG's publications will also assist in more peer reviewing, as more researchers are made aware of its publications.

The fourth section, entitled "Conservation," describes LBG's past attempts and future plans for the promotion of conservation awareness. Through this section, the importance of conservation to LBG is implied, as well as LBG's goals and reasons for the promoting conservation. Both researchers surveyed mentioned the importance of conservation programs through the training of school teachers or talks to local groups. For example, according to Mr. Eric Chaves of INBio, a successful educational program

run by INBio, has trained school teachers to be tour guides for their own school children, which has in turn brought many school children to the INBio park. Past activities done to promote conservation at LBG are described in the prospectus, such as orchid exhibitions and the culture of 5000 endangered orchid species. Finally, a brief description is given about how the publications (such as *Epidendrum*) promote conservation awareness.

The fifth section, "Education," explains LBG's educational activities. First, previous examples of educational programs geared to both children and tour guides are described. According to botany students at the University of Costa Rica, the most important aspects of LBG's educational programs include volunteer opportunities, programs or courses for orchid selection, field studies, and information on the various orchid species (classes or lectures). Moreover, according to Dr. Robert Matlock of La Selva biological station, an environmental education program provides a meaningful experience for local school children. Field studies are also an important aspect of educational programming. Thus, all these areas, as well as the growing library, were emphasized in the description of LBG's current educational programs.

The sixth section titled "Major Events Sponsored by LBG" describes happenings held at LBG – in the past, present, and future. Of particular importance, according to all researchers surveyed, are the Mesoamerican Seminars on Orchidology and Conservation, one held in 1998 and another in 2001. Furthermore, conferences, events for the public, and shows for students or orchid lovers are included in this section. Plans for future conferences are also included, along with their goals and purpose, and how people who attend will benefit.

The next section, titled "Future goals," begins by stating that a capital campaign will be occurring at LBG to fund several activities. Then a description of plans in four major areas, namely facilities & centers, activities and programs, appearance, and literary publications, are given. They are placed in those groups because those are the major areas in which LBG will attempt to seek funding. Plans for important facilities and centers, such as an orchidarium and new research building, are listed first because potential donors will want to understand why LBG will want add the stated buildings or equipment. The areas in which LBG plans to expand its research, such as orchid reproduction and taxonomy, are also included. Explaining the areas in which LBG plans to expand its research is important in order to attract a variety of research specialists. Then, the prospectus describes future, planned activities for enhancing conservation programs. Other descriptions in this section include planned programs in the areas of orchid collection, lectures and courses for university students, cultural concerts and activities to provide outreach to the community, and possible international volunteer opportunities. Most of the information in this section is interpreted from the masterplan and prioritized according to input from the three audience groups.

In the prospectus, the last section, titled "Collaborators with LBG," lists the institutions that have collaborated with LBG in the past and in the present, mainly through the Mesoamerican Seminar for Orchidology, 2001. By giving the reader an impression of the immense, diverse group of institutions that have collaborated with LBG at just this one seminar, we are suggesting that those institutions find LBG appealing. Thus the reader (university departments, conservation societies, and botanical research centers) should consider forming a partnership with LBG or supporting its work.

In summation, the prospectus is designed to emphasize LBG's services or programs outlined by the masterplan that would be of most interest to scholars and researchers. Furthermore, the prospectus describes major projects and their rationale, such as construction of a visitor's room and auditorium, in hopes of soliciting donors who may be interested in funding a particular construction project. The website, by contrast, is designed to be more visually appealing to all its users. Much of the material in the prospectus can be used in the final, implemented website. The website outline contains a connected network of links to provide up-to-date information about LBG. In both cases, the website and prospectus reach out to potential collaborators with and contributors to LBG.

Chapter 5. Conclusions and Recommendations

5.1 Why a Website and Prospectus?

While the LBG website may be the most efficient way to disseminate globally LBG's future plans, a prospectus needs to complement the website since it is a more direct way of approaching those who will benefit from LBG and eventually support it, such as professionals, scholars, and universities. Having both a prospectus and website go hand in hand is ideal since each reinforces the other. The URL address for the website will be printed on the prospectus, along with other contact information. Similarly, a link to the prospectus, which can be downloaded in several formats, will be placed on the website. The content of the prospectus is derived from the masterplan but is shaped to reflect interests found among a variety of potential audiences. Basically, the website will reflect headlines and featured news releases of what LBG has been doing, including its new discoveries and its progress in the masterplan, to provide an idea to its audience of how LBG is improving. This way they will be more knowledgeable about LBG in general. This increased knowledge about LBG will encourage more partnerships.

5.2 Implementation of the Website

The primary purpose of the LBG website is to provide a means of electronic communication about LBG's services, potential, and resources, to a mass audience. Since most scientists, students, and organization today are web savvy, a website is the most efficient means of communication and dissemination of information about LBG. People will be able to search for institutions with outstanding epiphyte conservation and research programs. These audiences will hopefully find LBG and come to recognize the

unique role of LBG in epiphyte conservation, research, and taxonomy, and hence feel inclined to assist LBG through donations and other forms of support.

A secure server will need to be established so that anyone can join LBG or contribute money to LBG online (using a credit card, for example). For this same reason, online membership forms will need to be created. This website will need to be developed by keeping aesthetics and layout in harmony with content. It would be ideal to make the homepage as visually attractive as possible. For instance, pictures of orchids and the garden can be placed next to the relevant subject in the text. Pictures of events, the garden, or other noteworthy landmarks at LBG can be placed on the homepage. Additionally, important upcoming or special events should be highlighted on the homepage, underneath the title of LBG. Scrolling text may also be an option to provide a livelier feel. Of course, there must be an easy navigation to allow one to find their way around the website.

Obtaining and maintaining the infrastructure for a website, database, and server need to be addressed. A large number of hits on the website should be anticipated; thus LBG will need to establish a sturdy server and obtain the correct computer hardware, such as fiber optic cable. Adequate funding (possibly in the form of gifts) for such a server may be obtained through U.CR once support is received from organizations and researchers. LBG will need to address promotion and marketing of the website. This can be accomplished through word of mouth, by placing a URL address on the prospectus brochure, or by informing current LBG's partners and asking them to place a link on their own webpages to LBG's website (under the category of "friends" or "partners"). Also,

LBG must choose a proper Internet Service Provider in the future so that the number of visitors to the website is optimal.

An important item in the website is the "Friends of the Garden" section. This will provide a communication link between other organizations or persons with similar goals and interests as LBG. It contains a list of current collaborators, membership information, as well as how visitors to the site can contribute or become a member of LBG. This will create a direct outreach for the financial and organizational support which LBG seeks. One section on the webpage also contains information on how an individual or corporation can donate without becoming a member, i.e., anonymously.

We expect that once the information technology server is set up by Mr. Walter Schug, a friend of LBG, a functional email system will also be arranged. This is crucial for communication with other scientists, organizations, and botanical gardens who may be interested in visiting LBG or in joining forces with its various programs. Prompt attention to all requests for information from LBG is essential for establishing its credibility and reliability. Additionally, we suggest that a mirror site be arranged at a partner institution which displays the same content as the LBG website but is "back up" in case the LBG server malfunctions.

5.3 Distributing the Prospectus

The prospectus has been created in the form of a brochure. If the LBG staff desires, the prospectus may be translated into a Spanish version. This brochure must be in a form that is not easily thrown out because it is visually attractive, containing pictures which gives the reader a sense of the LBG collection. It can be distributed to anyone who

visits LBG and it could be mailed or faxed to LBG's current collaborators to strengthen partnerships with them. Along with the fax or mail will be a cover letter, presenting LBG by summarizing its strengths and its plans for improvement. The letter should also announce plans for a Capital Campaign that will take place to fund future developments, and request donation and feedback for these developments. The letter should be drafted by the executive director, inviting the recipients of the prospectus to invest in the future of LBG. An LBG staff member or volunteer should then follow up with the recipients within the next few days.

The first phase of distribution should be to people and organizations that LBG is familiar with. This includes tourists who have or who are currently visiting LBG, philanthropic organizations who have visited LBG, such as the German Orchid Society or Pleurothallid Alliance, and researchers who have worked at LBG. The second phase should be distribution within the Costa Rican community. The citizens of Cartago need to be informed about LBG just as much as citizens of the United States or England. Orchid conservation societies in Costa Rica could distribute the prospectus brochures to the community to describe all LBG has to offer. Any orchid lovers who receive the brochure will then become aware of LBG's collections and educational programs for conservation, both present and planned. This could also increase the number of tourists who come to LBG. The next phase of distribution should be to other orchid societies or orchid scholars that have not yet heard of LBG but have similar goals and interests. A list of these can be obtained from current friends of LBG.

The fourth phase of distribution should be to institutions with large or well-known biology or botany departments. Anyone who is interested in epiphyte research in these

departments, including professors, staff members, and students, should have access to the prospectus. The administrative offices of these departments can be contacted by telephone or email, and the prospectus can be faxed or mailed in large numbers. Researchers or students will then be able to visit LBG after they are made aware of the potential and breadth of activities and resources. Furthermore, the home institutions of the researchers may be able to sponsor their trips to LBG once they are made aware of the research programs offered.

The prospectus may also be distributed to large corporations such as Amanco, a company dealing with building construction in Cartago, who may be interested in funding construction on ground areas or buildings at LBG. One of LBG's major goals is to construct a research building in the near future. Major donors need to be made aware of LBG's plans for progress, toward the good cause of epiphyte preservation.

Lastly, the prospectus may be sent to embassies of governments who are interested in epiphyte and orchid conservation, such as Japan or Taiwan. Epiphyte conservation organizations within those two countries, for example may be very interested in forming partnerships with a Costa Rican orchid center. Once they are made aware of LBG's biodiversity, they will surely become curious about LBG's immediate plans and goals for the future.

The capital campaign can be set in motion after the distribution of the prospectus by publicly announcing LBG's intent to raise funds. A recognition device, such as a monument or statue, can be constructed containing the names and logos of the largest donors. Lectures or meetings can also be held at LBG to explain to the public the basis and rationale behind the campaign. Furthermore, press releases on the LBG website can

announce the campaign to vast audiences. It is highly recommended that LBG pre-set the number and amount of each type of gift it would like to receive, as well the total amount of money it would like to receive at the end of the campaign, and make that information public.

5.4 A Vision for LBG

We are submitting both the prototype of the prospectus and website electronically to the executive director of Lankester Botanical Gardens for his review. The LBG staff will then be able tailor both to a version that meets its needs. Furthermore, in order to set in motion the cycle of support and to make more people become aware of LBG, a consultant should be recruited to organize and provide advice for the capital campaign once LBG has obtained adequate finances.

A fully functional website and a brochure will help LBG garner support from scholars and students as well as orchid lovers. Registering online as a member is not only fast and efficient, but preferred by most scientists, students, and the general public. Once all audiences are made aware of LBG's exceptional collections and programs via the prospectus and website, they will be more likely to partner with LBG and/or contribute on a regular basis.

Thus, we expect that the implementation of a website and distribution of a prospectus will set in motion the cycle of support, greater visibility, and enhancement of programs envisioned in the masterplan. Communicating LBG's strengths is key in starting this cycle. Both these methods of communication appeal to a wide variety of constituents – from researchers, to orchid lovers, to students. Indeed, LBG needs

continuous self-assessment of its priorities and goals, as well as strategic planning – a careful examination of the audience to which the research center will be geared. Additionally, external support and visibility will allow LBG to attract the staff and researchers needed to become one of the preeminent centers for epiphyte research in Mesoamerica.

In summation, orchid species today are in dire need of preservation. Botanical research centers are important vehicles in the conservation, taxonomy, and identification of orchids and epiphyte species. It is our hopes that, through our goals in this project, we have assisted Lankester Botanical Gardens in achieving one part of its plan for the decade. By creating a means by which LBG can disseminate knowledge of its virtues, epiphyte scholars will understand more about this "hidden jewel" in Mesoamerica and support LBG's cause. LBG can then further its mission of promoting awareness of orchid conservation throughout society, which will make people aware of the importance of epiphytes and methods to help save them.

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Appendix A – Mission and Organization

Lankester Botanical Gardens

A British orchid enthusiast, Charles Lankester, originally established Lankester Botanical Garden in the 1950's as a private garden (Davis, Perrotta, & Zahnstecher, 2001, p. 102). The North American Society of Orchidology and the Stanley Smith Foundation of England then bought the garden and later donated it to the University of Costa Rica (UCR). Under the new ownership, the infrastructure and financial support suffered. UCR was not equipped to handle the garden for several years, and LBG had to operate for those years without support. Today, the internationally recognized garden is now a branch of the university's biology department. Sr. Jorge Warner is executive director.

Lankester serves to promote the conservation of epiphytes, with attention focused on orchids (Davis, Perrotta, & Zahnstecher, 2001, p. 102). The garden desires to emphasize the beauty of these plants, and protect biodiversity in the rainforest through horticulture, investigation, and environmental education. In time, LBG wishes to become a recognized world leader in the preservation of orchids through various prestigious projects and by working with prominent world-renowned institutions.

According to Jorge Warner, Director of LBG, UCR funded the garden with $56,500 in 2000, 97% of which was used for 70% of employee wages. The remaining $1,500 was used to maintain and supply the garden. Since the garden is owned by UCR, the university pays for phone, electric, and water bills. Besides receiving financial support from the University of Costa Rica, LBG generates income from admission fees and a gift shop. From admission fees, LBG made a total of $45,000 a year. Half of that

goes to maintenance, and the rest goes to employee salaries. The garden receives an estimated $50,000 a year from items sold in its gift shop, and keeps $17,500, which is used for gift shop employee salaries and to pay for the cost of the gift shop. In addition, LBG must pay 20% of the cost of overhead. The annual research budget ranges from $7000 to $8000, which is the same amount of money that LBG received from donations in 2000 (Davis, Perrotta, Zahnstecher, 2001, pp. 103-104).

Our project is aimed at helping LBG succeed in its vision as one of the preeminent centers for epiphyte conservation research. A fully functional website and hardcopy prospectus is designed to communicate LBG's assets to an outside audience. This should alleviate much of the isolation that is currently characteristic of LBG. Both the prospectus and website should reveal LBG, Cartago's hidden jewel, to philanthropic orchid societies and researchers alike who share the common goal of orchid conservation and research.

We are currently working with Jorge Warner. He is the executive director of the garden. His responsibilities include implementation of the LBG masterplan and allocation of resources required to enact different parts of the plan. We also work with Franco Pupulin, director of research programs at LBG. His work in taxonomy is renowned. He is also editor of the newsletter *Epidendrum,* which describes many of the conservation activities occurring at LBG. The Academic Director, who is also a faculty at the biology department at the University of Costa Rica, is Dr. Carlos O. Morales. The Scientific Council consists of Dr. Morales, Prof. Pupulin, and Sr. Warner. The Advising committee consists of Dr. Morales, Sr. Warner, and five other respected scholars.

Finally, the Scientific Committee of *Lankesteriana* consists of well-known orchid researchers from various institutions.

We expect the long-term impacts of our project on LBG to increase its visibility and thus form partnerships with other organizations and institutions. This should thus make LBG less isolated. Once organizations and individuals who share common goals of LBG discover LBG's potentials, they will support it. More communication will occur with LBG and outside organizations, which will require a state-of-the-art email system and hopefully increase the efficiency of the LBG staff. Eventually LBG will attract more research and education staff and will grow larger, with a larger support base.

Appendix B - Focus Group with University of Costa Rica students

A focus group was conducted through the permission of Professor. Ana Lizano, Department of Biology, University of Costa Rica, on June 21, 2002. Raquib Mazumder sat in on a botany lecture from 7-9AM and then asked a group of students several questions about LBG.

Goal: To understand how LBG's potential educational services (such as coursework and field research) can be best communicated and disseminated through means such as the website. This issue of disseminating the information to students will be discussed, and what aspects of LBG's educational services would they be most interested in seeing?

1. Please state your major and the area of botany you have studied or completed research in.

2. Have you been involved with any botanical gardens? If so, which ones, and how?

One student was a volunteer at LBG. His task was to inventory various plant samples.

3. Are you aware of Lankester Botanical Gardens' current educational programs, such as student-led research?

Most were somewhat aware of the research at LBG, but not many had participated.

4. What is your experience with Lankester Botanical Garden's current educational programs?

One student was very familiar with the work of Franco Pupulin, and stated he had worked under him.

5. Are you aware of future plans for the enhancement of LBG's educational programs (such as a new graduate course)?

No, but they seemed interested in finding out.

Now, describe LBG's plans for enhancement of its educational programs for students:

a). Describe what makes LBG unique in terms of its collections and research and its unique role in epiphyte conservation.

b). Education

Today, courses in orchids and epiphytes for graduate students do not exist at LBG. With the creation of credit- courses dedicated to these subject areas, LBG will reaffirm their main role of orchidology to the national and international level. In the future, LBG will incorporate a biology program, alternating between every year a course in orchidology and a course in epiphytes. LBG also will host a course for orchid lovers. This course will take the students on visits to various sites in Costa Rica where orchids grow wild. There will be about 2 courses a year, and will be offered to the national and international public.

Every year, LBG hosts more than 15,000 students aging from the preschool to the high school level. Because of the rain in Costa Rica, especially during its winter months, it can be difficult to be able to provide the students with an ample experience of the garden and the activities that go on within it. LBG needs to construct an auditorium for this reason and also to give lectures to college students. An auditorium that can hold 50 people would be feasible. LBG already has the plans and list of materials they will need for the construction.

An accomplished objective of LBG was to organize and host the Mesoamerican Seminar or Orchidology and Conservation. In May 2001, LBG hosted this seminar. It was an important success for LBG and brought much recognition to the garden. The seminar attracted international researchers and directors of botanical gardens, and entertained a collaboration of ideas, lectures, and speeches important to the botanical community.

6. Can you explain what elements of this plan are most important in the successful development of LBG's educational programs, in your opinions?

The courses which emphasize field studies are most important. Also, one student wanted to partake in research of orchid hybrids. Furthermore, the students wanted to see training for orchid collection and an informative description of the various species (briefly, during tours).

7. How can LBG promote these services to make them more appealing to students at U.CR?

Most students agreed that the webpage was a useful way to market LBG's strengths.

12. Thank you for your time. If you have any other input about LBG's educational services or what you would like to see from LBG's educational programs in the future, please say so. If you have any suggests about how LBG's plans and potentials can be better communicated, please say so.

Three students left their email addresses.

Appendix C - Interview with Dr. Eric Mata

The following interview with Dr. Eric Mata was conducted in person at Instituto Nacional de Biodiversidad (INBio), June 20, 2002, 2:00 PM. Interviewers were Raquib Mazumder and Lauren O'Connell. Dr. Eric Mata is director of information technology at INBio. His name was given to us from Mr. Eric Chaves, general manager of INBioparque. The answers below represent a summary of the conservation with Dr. Mata.

1. Can you provide an overview of the INBioparque website content? How was this content arrived at?

First, collections and the database were emphasized. It was important to deliver information to taxonomists. Having referenced samples was also important. The INBioparque website has been geared to tourists.

2. Can you provide an overview of the INBioparque website organization? How was this organization arrived at? (What key ideas were important in deciding the organization?)

A map of the website content is available. Both English and Spanish versions are available. The mirror sites for the translated sites are at University of Alberta and at Missouri Botanical Garden. Initially, the organization of the website reflected the organizational structure of INBio. However, this was not very appealing, so the organization of the website was changed to reflect the demands of researchers, students, and tourists.

3. What key ideas were kept in mind while deciding the aesthetics of the website?

The INBio web contains a marketing flavor. All the displays are within context of the content.

4. Can you provide an overview and description of the INBio website structure and layout? How was this structure/layout arrived at?

85% of the visits to the web occur at the taxonomic database. ATA is the name of the database where information about species is maintained. Terms of limitations for the information is provided. A Basic Information Unit (UBI) contains a publication about a particular species. Most of the information provided pertains to conservation areas. Either advanced or basic reports may be obtained. It took 3 years to develop the ATA system, and 1 year to develop the UBI system. Both are updated regularly.

5. What features are most important in attracting funders and partners, for example, what aspects of content, its organization, its aesthetics, and it structure/layout?

A yearly report should be established as a link to allow the partners to understand the organization. This "progress report" allows other foundations to understand our immediate plans and choose to fund us accordingly. Also, the web is important in promoting a network of relationships.

Appendix D - Interview with Dr. Robert Matlock

The following interview with Dr. Robert Matlock was conducted in person at La Selva Biological Station on June 13, 2002, at 12:00PM. Interviewers were Raquib Mazumder and Lauren O'Connell. Dr. Robert Matlock is director of research at La Selva Biological Station. We were given his name through the Organization for Tropical Science (OTS) Headquarters. The answers below are a summary of his responses.

1. You can help us by discussing with us about La Selva Biological Station. How was La Selva started (please give a brief history), and what were the stages of La Selva from its beginnings to its present?

La Selva was originally a farm owned by Leslie Holdridge. OTS then bought it in 1968 after administering tropical ecology courses on this site since 1963. The Holdridge House was remodeled into a dormitory. A new academic center and labs were also added, along with new paths.

2. What is La Selva's mission? What are its goals?

The primary mission of both OTS and La Selva are to promote education, reseach, and the rational use of resources in the tropics. La Selva is a place for students to enroll in field courses.

3. How has La Selva obtained the resources, partnership, and funding to attract researchers and expand its research programs?

40% of La Selva's funding comes from the NSF. This totals to approximately $500,000 per year. A Capital Campaign is in place and La Selva plans to acquire an endowment in the future. The remaining operating revenue is achieved through station fees from visitors. A capital donation from the A.W. Mellon foundation has been used to fund the construction of buildings in the past. A capital account is also used to store revenue.

4. How has La Selva attracted funding and resources to help its services grow? What have its priorities been in order to enhance its resources and services?

Most of La Selva's marketing has been through word of mouth. It is a member of OTS, a consortium of 64 institutions, which allows resource sharing. Marketing to tourists is done through a consultant. Marketing in the United States is accomplished through a station for courses. The consortium is used to attract students; the main office of OTS is at Duke.

5. How has the masterplan been conceived and how will it obtain resources to implement the elements of the masterplan?

The masterplan essentially describes what can and can't be done at La Selva. It sets limits for station use. An advisory committee has been enacted to review station operations on a regular basis.

6. Is there a prospectus for La Selva? Can we either see a copy or will you give us a brief description of it

A copy of our masterplan and operations manual has been emailed to you.

7. How has the La Selva website been developed and maintained? How is it important in attracting collaborators, scholars, and potential partners?

The informatics aspects of our website is funded through operating costs. The equipment is funded through a capital budget. The website itself is funded through both.

8. What most important areas and content of the LBG website would make it attractive to outside viewers? (in your opinion)

Important content includes weather data, the number of orchid species, botanical information, regulations for conducting research, and rates charged for researchers. Also, a web-based guide to orchids would be helpful.

9. What educational programs and services (such as student research, coursework) has La Selva implemented in order to attract more students?

Graduate courses are mostly research and undergraduate courses are more classroom oriented. There is an even emphasis placed on both courses and research, and courses always contain field work. Our undergraduate program is accredited by Duke, and the graduate program is accredited by the University of Costa Rica. Many German researchers join. The main natural resource attraction at La Selva is the primary growth forest.

10. How has La Selva been involved with the local Costa Rican community?

There is an environmental education program in place. School children visit from 10 different local schools to participate in activities. There are a few projects in place geared toward the comunity. One is a management plan for Rio Sarapiqui, monitoring water supply quality. Another plan involves a biological corridor running northward to Nicaragua.

Appendix E - Interview with Dr. Julio Calvo

The following interview with Dr. Julio Calvo was conducted in person at the Tropical Science Center, in San Jose, Costa Rica, on June 7, 2002 at 3:00 PM. Interviewers were Raquib Mazumder and Lauren O'Connell. Dr. Julio Calvo is executive director of the Tropical Science Center. The answers below are not direct quotations from the interview, but rather paraphrases of his ideas.

Gave Introduction.... Problem statement, why LBG is important, why we want to help LBG, and what we intend to accomplish by designing a prospectus

What is your organization's area of expertise?
- do you have plans for development?
- how has your organization grown and sustained itself in the past? What initiatives has it taken, and with what programs?
-do you currently have a masterplan in place? How have you organized and prioritized your planned activities?
-(may we have a copy of this plan?)
- What activities (research, education, ecotourism) are most important in a field station or botanical garden?

We have six biological research stations, the largest one being Monteverde Cloud Forest, receiving 60,000 visitors annually. This generates $1,000,000 per year, of which $700,000 is spent. $500,000 of net income is invested in trails, bridges, and a fund trust. $300,000 is spent on labs, subsidizing community programs, and an infrastructure for research and education. Our masterplan includes the biological management of resources and a strategic plan for high impact areas (200 acres). The biological management plan is based on trial-and-error, an includes a strategic plan for tourist areas. The management plan has been a success. It is important to start with small plans, attract partners, and then expand. In other words, proposals must be drafted in several areas, one at a time, piece by piece.

3). What knowledge do you have of LBG?

-if none, explain about LBG, its activities, its masterplan, its lack of reputation and its desire to expand, then ask for advice

-if some, ask for advice in growth of LBG's services and reputation

- if much, can you prioritize the plans listed in the masterplan, in order of importance

- what do you think of the services at LBG? What more would you like to see? How can they be improved?

It is important that LBG diversify its research activities such as epiphyte reproduction and education. Visitor income allows investments in research and education programs. The masterplan must be reviewed based on need by potential partners. An input of information from these partners must be obtained and resources must be channeled accordingly. Conservation of biodiversity is also important to educate the general public and to attract researchers. Classrooms and other facilities need to be established before partners are attracted. Proposals can also be drafted to partners. Also, if researchers from Europe come to LBG for courses, perhaps the German government can provide money for their training?

In my opinion, the garden needs its own management because the University of Costa Rica seems to provide little support nowadays. Donations by email may be important LBG should open foundations in the U.S. to market itself. Also, partnerships with institutions in Japan and China should be explored through their respective embassies.

Appendix F - Interview with Mr. Eric Chaves

The following interview with Mr. Eric Chaves was conducted on-site, in his office, on June 6, 2002 at 2:30 PM. Interviewers were Raquib Mazumder and Lauren O'Connell. Mr. Eric Chaves is general manager of Instituto Nacional de Biodiversidad (INBio). We received his name upon contacting the park by telephone and asking to speak to a knowledgeable staff regarding park growth. The answers below are not direct quotations, but paraphrases of his ideas.

Gave Introduction.... Problem statement, why LBG is important, why we want to help LBG, and what we intend to accomplish by designing a prospectus

How has your organization grown and sustained itself in the past? What initiatives has it taken, and with what programs?

INBio contains over 2,500 species. INBio concentrates on bioprospecting, or research of various species in pharmaceuticals, in inventory of specimens, and in information management. We have an entrance fee to enter the park of 4 dollars to Central Americans and Costa Ricans, for our other international visitors, they must pay a fee of twelve dollars. We used to charge them twenty dollars but had to lower the price. This fee includes a two hour tour of the facility. We also have a restaurant and a gift shop at the facility. Most of our funding comes from visitors and companies who donate money to us. The tourist income provides revenue for operating costs. This year, we are investing $120,000 into our advertising campaign. This includes commercials on the news, radio, and the internet as well as through tour companies.

Every year, there is a booth for In Bio at the World Tourist Market in London, C-Trade in Miami, the International Tourist Fair in Berlin, and FITUR in Madrid. This gives us good exposure. In order to sustain the park, we have to emphasize it as a business, not a research park. Once a month, we have an orchid fair. Local artists whose works relate to biodiversity come to exhibit their pieces. There are also lectures and a theater production. The cost to attend this is the regular entrance fee; however children are charged 700 colones. The general public is invited.

Sonyland Tours in Hakensack, New Jersey donates to us. We bring local school children to come experience the tour. The ICASIA trains school teachers to become tour guides at the park. It is less expensive for the children to come to the park and it has been proven that children will pay more attention to the tour guides if they are their own teachers.

Do you currently have a master plan in place? How have you organized and prioritized your planned activities?

Yes we do have a master plan. The focus of the master plan is to have a self-sustainable institution by the year 2006. We are a non-profit organization. We would like to break even as well.

What activities (research, education, ecotourism) are most important in a field station or botanical garden?

INBio focuses heavily on taxonomy research. Once a month, our taxonomists meet to discuss their findings. They collect plant species through the supervision of the head taxonomist. Erik Vargas is the head of our information management system. All of our research from the beginning of INBio has been locked into our information management system. Ana Guevara is the head of bioprospecting. She conducts research for pharmaceutical species. She can provide information on the classification of taxonomy. Our bioprospecting department does research work with Merck Pharmaceuticals.

What knowledge do you have of LBG? What do you think of the services at LBG? What more would you like to see? How can they be improved?

LBG needs to work on its infrastructure to showcase its collections and facilities. The aesthetics of it need to be improved. They need to conduct small advertising. They need the general public to visit the garden. The Epidendrium can be a form of advertising. We asked LBG if they could manage our orchids and epiphyte section of our humid forest. They had cancelled our last meeting and we are waiting for a call from them to reschedule. We would like to establish a better relationship with them.

Appendix G - The Master Plan of Lankester Botanical Garden

The following information has been taken and interpreted from the masterplan of LBG.

The master plan of LBG, entitled El Jardin Botanico Lankester En El Nuevo Siglo: Vision Estrategica y Proyectos Para Su Desarrollo, contains future plans for LBG over the next decade. It targets four areas of improvement and development for the garden, including, horticulture, research, education, and development and communication. The master plan describes what LBG needs to accomplish in the present and future in order to fulfill its ultimate goal of becoming the primary center for epiphyte research and conservation in Mesoamerica.

The stated mission for LBG is to promote conservation, enjoyment, and the sustainable use of epiphytic plants, especially orchids, mainly in horticulture, research, and environmental education. The purpose of the mission is to describe the motivation behind the botanical garden and the philosophy it abides by in its daily activities. LBG is striving to improve the quality of the garden and therefore has set a vision: LBG, united with the University of Costa Rica, is dedicated to promoting the conservation of orchids and other types of plants through horticulture, scientific investigation and environmental education, is backed by internationally prestigious institutions, and protect the cooperation with other international prestigious institutions. This vision places a new emphasis on sustainable development of the garden. Botanical gardens need to collaborate in the promotion of biological diversification. This leads to research in the development and the educating the public. LBG desires to develop programs and

activities that meet the expectations of similar institutions and in the international scientific community.

Horticulture

LBG plans on creating a taxonomic database. In order to do this, they need to hire a taxonomist to go through the garden and identify and label all the plants. Regrettably, the garden lacks adequate labels and an electronic inventory. LBG realizes that when the visiting public and tourists, as well as scientists, come to the garden, it is of fundamental importance that they be informed of the names and types of plants. Due to financial and time constraints, LBG has yet to accomplish this task.

The hothouses currently located at LBG are insufficient for growing orchids. A hothouse is a heated room that is used for the cultivation of plants. Because of this, LBG is restricted in introducing new plant species for scientific study and for exhibition. Some of the hothouses require a thorough remodeling to be used to their maximum potential. The purpose of this project is to construct new hothouses at LBG for the existing collections of plants as well as remodel the existing hothouses for the further development of horticultural activities at LBG. Another limiting factor due to the inadequacy of the hothouses is the fact that LBG cannot cultivate orchids that they might sell nationally and internationally. Otherwise, LBG would have the potential to bring in significant profits from the orchid industry that would help finance the garden.

Within the garden, LBG has roughly 2.5 kilometers of footpaths that pass the principal collections of plants. These footpaths are printed in the landscape drawing of LBG. The new areas of LBG and the places where future construction will take place

(such as buildings and additions to the garden) are not included in the landscape drawings. LBG would like to update its landscape drawing. Thus, LBG would be able to hand out self- guided tours to visitors if all the footpaths in the garden as well as the names of all the plants were in an updated landscape drawing. While on the tour, the visitors would be able to identify each plant species not only from the self-guided tour, but also by the labeling of the plants in the actual garden.

Research

LBG is currently publishing Lankersteriana, at irregular intervals, a scientific journal devoted to the publication of articles with a special focus on epiphyte botany and orchid phylogeny, ecology, evolution, and physiology. Lankersteraina includes book reviews and discussions of conferences on relevant topics. LBG has the opportunity to edit their first edition of Icones Plantrun Tropicarum. Icones Plantrun Tropicarum, dedicated to neotropical orchids, was first published by Selby Botanical Gardens in 1984 and since then volumes have been written by Missouri Botanical Garden. LBG could contribute to a new edition focusing on and illustrating native orchid flora specific to Costa Rica.

LBG has requested the construction of an Anexo del Herbario in association with the University of Costa Rica in San José at LBG. A herbarium contains pressed and dried plant specimens to be used as a reference center by scientists and researchers. The Anexo de Herbario will be run by administration from the University of Costa Rica.

The laboratory for offspring plants grown in-vitro needs to be enlarged and improved. Since 1992, the laboratory has cultivated more than forty species of rare and

endangered orchids. Furthermore, LBG plans to create a seed bank for neotropical orchids that are in danger of extinction. Due to limitations on space and equipment, LBG has not been able to develop academic and research activities centered on endangered species. LBG intends to expand the laboratory and construct an area for the cultivation of rare orchid plant species.

LBG believes it has a responsibility to advance the inventory, taxonomy, and horticulture of native orchids in Costa Rica. The objective of this project is for LBG to have a better knowledge of the distribution and the habitat of the native orchids of Costa Rica. This orchid taxonomy study, a work in progress, is far from completion but represents one of the most important programs required to diversify LBG's interests. The discovery of new species of orchids is one goal of these endeavors. Likewise, LBG is developing strategies to permanently guarantee the conservation of native species whose populations are naturally small or have been diminished by human activities. LBG will establish a documentation center of Mesoamerican orchids. Bibliographic material and information about Mesoamerican orchids from the past to the present day will be described, photographed, illustrated here. This will be used electronically, on the internet, for students, researchers, and orchid lovers from all over the world.

LBG plans to create a program to keep an inventory of how many epiphytic plants are located in the national parks. They propose that they will keep track of what species are prevalent in "hot spots", such as the Central Pacific and the Cordillera Costen□a, and in protected areas.

LBG contains a substantial area of secondary forest whose ecological succession has not been studied. Observing and quantifying the factors and elements that take part in

the recuperation of the forest is another project of LBG. LBG would like to further this and study other forests, specifically in the Central Valley. The objective of this project is to establish a regional and national model on the recuperation of forests as well as to explain the possible benefits of human influence on the forest.

Although LBG specializes in orchidology, all types of epiphytes are studied at the research center. The establishment of various collections of epiphytes will make LBG much more attractive to conservationists and the public.

In collaboration with the Natural History Museum of Vienna, LBG would like to research and write a biography of the work of A.R. Endres, who dedicated his life to botanical exploration of orchid species. In 1858, the German botanist H.G. Reinchenbach received hundreds of orchid species from Costa Rica accompanied by detailed descriptions and intricate illustrations of the plants. This work was invaluable, however, it was forgotten until A. R. Endres. A. R. Endres realized that the work was priceless and continued to elaborate on the investigation. The work of A. R. Endres represents Costa Rican pride in native orchids.

Education

Today, courses in orchids and epiphytes for graduate students do not exist at LBG. With the creation of credit- courses dedicated to these subject areas, LBG will bring their main focus on orchidology to a national and international level. In the future, LBG will incorporate a biology program, alternating every year between a course in orchidology and a course in epiphytes. LBG also will host a course for orchid lovers. This course will take students on visits to various sites in Costa Rica where orchids grow wild. There will

be two courses a year offered to anyone from Costa Rica or abroad who has an interest in these beautiful and exotic flora.

Every year, LBG hosts more than 15,000 students aging from the preschool to the high school level. Because of the abundant rain in Costa Rica, especially during its rainy season, it can be difficult to provide students with an ample experience of the garden and the activities that go on within it. LBG needs to construct an auditorium capable of holding 50 people, to give lectures to students of all ages. LBG already has the plans and list of materials they will need for the construction.

An accomplished objective of LBG was to organize and host the Mesoamerican Seminar or Orchidology and Conservation. In May 2001, LBG hosted this seminar. It was an important success for LBG and brought much recognition to the garden. The seminar attracted international researchers and directors of botanical gardens, and promoted collaboration of ideas, lectures, and speeches of great importance to the botanical community.

Development and Communication

LBG would like to build a structure where they can exhibit their epiphytic plants, namely, an orchidarium. Some of the plants, such as miniature orchids, are confined to hothouses that do not allow for public exhibition. The public sees only a small amount of the collections at LBG. An orchidarium will allow the public to discover the historical legacy of LBG as well as the current studies and conservation efforts at LBG. An orchidarium would symbolize the heart of LBG's activities and goals.

LBG lacks a defined organizational image, which inhibits the public from easily identifying products, activities, visibility, and communication from the garden. A clear "corporate" image would allow LBG to gain respect inside and outside the garden.

Today, LBG employees do not have a set agenda; it is possible for one person to work on many different types of tasks. External communication (publications, newspaper articles) will be developed and defined, leading to less ambiguity in the eyes of the public.

It would like to improve the security of the garden by means of hiring guards and constructing a wall to keep thieves out. They would like to enlarge the offering of services to visitors upon increasing visibility. The construction of a cafeteria, restaurant, an area for the sale of plants and articles of the garden, a center for environmental information, and a store to be named "Sobralia" are among building projects. LBG will also host orchid exhibitions.

LBG realizes that an optimal way to promote themselves to the public is through tourist pamphlets, brochures, and books. LBG will carry out a public plan, in which they will increase their visibility through as much public communication as possible.

An essential component in developing a greater appreciation for the garden is the sale of products specific to LBG. LBG plans on creating postcards, calendars, and other merchandise that can be sold at the gift shop. LBG will write and publish a series of three books entitled Belleza en extinction: Orquideas de Costa Rica with environmental information for the public and many pictures of orchids native to Costa Rica. Underneath the pictures there will be captions describing each orchid and information specific to that species plant. The book will be addressed to the general public, particularly, orchid-

enthusiasts. Another book LBG is planning to publish is Cien Orquideas de Costa Rica. The focus of this book will be to offer tourists a guide to orchids native to Costa Rica. It will give a history of Costa Rican orchids, as well as explain the distribution of orchids throughout the country and key places to visit in order to observe these plants. It will contain around one hundred and thirty high quality photographs and will be published in both Spanish and English. In addition, LBG will publish a guide to the garden, entitled Un mundo de plantas. This guide will contain historic facts as well as information about its activities and collections. Not only will the guide serve as an aide to visitors to the garden, but it will also convey information about LBG to a wider public.

Although there are many Costa Rica specific calendars containing images of flowers, the landscape and other natural wonders, there is no calendar solely containing photographs of orchids. This project, to be achieved within the coming year, will reaffirm the connection of LBG to orchids.

An important component of botanical gardens is its volunteers. LBG would like to incorporate a program of national and international volunteers. Another important component of botanical gardens is its website. Websites are important due to the fact that researchers, teachers, students, colleagues, tourists, and the local, national, and international public refer to websites on a daily basis. LBG recognizes this, and strives to create an informative, well- structured internet website. LBG would like to create and maintain a website and to increase public awareness of LBG.

As stated in the master plan, LBG would like to construct an area where they will sell plants and other products of the garden. They have already completed this task and in

the main foyer of the building near the entrance of the garden, is an area set out where they sell in vitro orchids, as well as products related to LBG, such as tee shirts.

LBG would like to construct an area for visitors, which illustrates the interrelations within the garden of the activities that LBG is currently developing together with elements of LBG's history and its future endeavors.

LBG would like to integrate more local Cartagan people into the garden. It plans on hosting cultural activities at the garden directed towards the local public. LBG would like to collaborate with the School of Music, Drama and Arts, and the Fine Arts programs at the University of Costa Rica in hopes of involving LBG with the local community.

Due to property losses in the past, LBG needs to improve its security. The plants at LBG not only have great scientific value, but also economic value. LBG needs to hire security guards and build a wall that will prevent thieves from entering and stealing from the garden.

Since LBG is a tourist landmark, they would like to create a cafeteria on site in order to bring in more revenue. At the cafeteria, people will be able to rest and eat during their visit to the garden.

Appendix H – Survey to Orchid Researchers

Dear Dr. [Reseacher]:

Greetings. We are two students from Worcester Polytechnic Institute, Worcester, MA, USA: Raquib Mazumder '03 (Biology/Biotechnology major), Lauren O'Connell '04 (Mechanical/Aerospace engineering major). We are conducting an undergraduate research project that consists of developing a prospectus for Lankester Botanical Garden (LBG) in Costa Rica. We are currently working with LBG in order to effectively analyze how LBG's collaborators perceive the strengths and weaknesses of LBG. A Masterplan for LBG has been drafted in order to set out the development and expansion of LBG over the next 10 years. We are interested in your views about LBG.

We are asking you to participate in our short survey based on your knowledge of LBG and your future expectations of LBG's services. We will be analyzing your input for use in the development of LBG's prospectus. Any input you give will be very helpful. All information (including names, institution, and location) will be kept confidential for the sole use of our study. Your input will help us design LBG's prospectus based on what you believe should be planned for future construction and activities at LBG.

The survey is attached to this email as a Word Document and is also available at the following URL:
http://users.wpi.edu/~r_mazum/iqp/research.doc . Please return this questionnaire by emailing r_mazum@wpi.edu, before June 19, 2002, so we will have adequate time to analyze your response. If you have any trouble accessing the survey either way, please email r_mazum@wpi.edu as soon as possible. Again, your opinions are very important to us.

Thank you very much for your time.

Sincerely,
Raquib Mazumder (r_mazum@wpi.edu)
Lauren O'Connell (laurenoc@wpi.edu)

[survey for researchers]: Please answer questions 1-6 in a few sentences:

1. With what institution are you associated?

2. What is your specific area of research?

3. Are you aware of Lankester Botanical Gardens' current activities, in terms of research and education?

4. What is your experience with Lankester Botanical Gardens, in terms of conferences or other collaboration?

5. Are you aware of any plans for the growth and promotion of LBG's research programs in the near future?

6. Briefly, what do you perceive are the strengths of Lankester Botanical Garden's research programs and services? What do you perceive as weaknesses?

7. Please rate the current quality of the following areas of LBG, and please briefly explain why:

	Excellent	Above Avg	Avg.	Below Avg.	Poor
Research projects	1	2	3	4	5
Research facilities	1	2	3	4	5
Journal publications	1	2	3	4	5
Database taxonomy system	1	2	3	4	5
Internet / Website	1	2	3	4	5
Conferences	1	2	3	4	5

8. Please prioritize the following improvements LBG would need to be more appealing to researchers, and please briefly explain why:

	Urgent	important	slightly important	not important
Research projects	1	2	3	4
Research facilities	1	2	3	4
Journal publications	1	2	3	4
Database taxonomy system	1	2	3	4
Internet / Website	1	2	3	4
Conferences	1	2	3	4

9. What additional services and research programs would you like to see at LBG?

Thank You!

Appendix I - Survey to Three Committees

Dear [ ]:

Greetings. We are two students from Worcester Polytechnic Institute, Worcester, MA, USA: Raquib Mazumder '03 (Biology/Biotechnology major), Lauren O'Connell '04 (Mechanical/Aerospace engineering major). We are conducting an undergraduate research project that consists of developing a prospectus for Lankester Botanical Garden (LBG) in Costa Rica. We are currently working with LBG in order to effectively analyze how LBG's collaborators perceive the strengths and weaknesses of LBG. A Masterplan for LBG has been drafted in order to set out the development and expansion of LBG over the next 10 years. We are interested in the []'s views on LBG.

We are asking you to distribute 3 short surveys to three Committees at [], namely the Education Committee, Scientific Committee, and Conservation Committee. We are interested in learning about each committee's future expectations of LBG's services. We will be analyzing this input for use in the development of LBG's prospectus. Any input they give will be very helpful. All information (including names, institution, and location) will be kept confidential for the sole use of our study. Each committee's input will help us design LBG's prospectus based on what they believe should be planned for future construction and activities at LBG. Each survey is attached to this email as a Word Document (each labelled, Education, Scientific, and Conservation Committee), and are also available at the following URLs:
http://users.wpi.edu/~r_mazum/iqp/education.doc ,
http://users.wpi.edu/~r_mazum/iqp/scientific.doc , and
http://users.wpi.edu/~r_mazum/iqp/conservation.doc.

Please return these three questionnaires by emailing r_mazum@wpi.edu, by June 19, 2002, so we will have adequate time to analyze the responses. Again, []'s opinions are very important to us. Also, if you would be able to email further comments on what LBG can accomplish to make itself more appealing as an orchid-conservation partner, that would be most appreciated.

Thank you very much for your time.

Sincerely,
Raquib Mazumder (r_mazum@wpi.edu)
Lauren O'Connell (laurenoc@wpi.edu)

[survey for]: To: Conservation Committee, []

Please answer questions 1-6 in a few sentences. All information (names, location, institution) will be kept confidential.

1. What is the main focus or mission of the Conservation Committee of the []?

2. In what ways has the committee supported orchid research and conservation in the past?

3. Is the committee aware of Lankester Botanical Gardens' current activities related to orchid conservation?

4. What is the committee's experience with Lankester Botanical Gardens, in terms of collaboration or with conservation-related activities?

5. Is the committee aware of plans for the growth and promotion of LBG's conservation programs in the near future?

6. Briefly, what does the committee perceive are the strengths of Lankester Botanical Garden's conservation programs and services? What does the committee perceive as LBG's primary weaknesses in this area?

7. Please rate the current quality of the following areas of LBG, and please briefly explain why:

	Excellent	Above Avg.	Avg.	Below Avg.	Poor
Ecotourist programs	1	2	3	4	5
Educational programs	1	2	3	4	5
Communications	1	2	3	4	5
Archive /collections display	1	2	3	4	5
Internet / Website	1	2	3	4	5
Conferences	1	2	3	4	5

8. Please prioritize the following improvements LBG would need to be more appealing to your committee, and please briefly explain why:

	Urgent	important	slightly important	not important
Ecotourist programs	1	2	3	4
Educational programs	1	2	3	4
Communications	1	2	3	4
Archive /collections display	1	2	3	4
Internet / Websites	1	2	3	4
Conferences	1	2	3	4

9. Would your committee be interested in forming a stronger partnership with LBG? What additional services and programs would it like to see from LBG in order to make it a more attractive orchid-conservation partner?

Thank You!

[survey for]: To: Education Committee

Please answer questions 1-6 in a few sentences. All information (location, names, and institution) will be kept confidential.

1. What is the main focus or mission of the Education Committee of []?

2. In what ways has the committee supported orchid educational programs in the past?

3. Is the committee aware of Lankester Botanical Gardens' current activities related to educational outreach?

4. What is the committee's experience with Lankester Botanical Gardens, in terms of collaboration or with educational outreach?

5. Is the committee aware of plans for the growth and promotion of LBG's educational programs in the near future?

6. Briefly, what does the committee perceive are the strengths of Lankester Botanical Garden's educational programs and services? What does the committee perceive as LBG's primary weaknesses in this area?

7. Please rate the quality of the following areas of LBG, and please briefly explain why:

	Excellent	Above Avg.	Avg.	Below Avg.	Poor
Ecotourist programs	1	2	3	4	5
Educational programs	1	2	3	4	5
Communications	1	2	3	4	5
Archive /collections display	1	2	3	4	5
Internet / Website	1	2	3	4	5
Conferences	1	2	3	4	5

8. Please prioritize the following improvements LBG would need to be more appealing to your committee, and please briefly explain why:

	Urgent	important	slightly important	not important
Ecotourist programs	1	2	3	4
Educational programs	1	2	3	4
Communications	1	2	3	4
Archive /collections display	1	2	3	4
Internet / Websites	1	2	3	4
Conferences	1	2	3	4

9. Would your committee be interested in forming a stronger partnership with LBG? What additional services and programs would it like to see from LBG in order to make it a more attractive orchid-preservation partner?

Thank You!

[survey for]: To: Scientific Committee

Please answer questions 1-6 in a few sentences. All information (location, names, and institution) will be kept confidential.

1. What is the main focus or mission of the Scientific Committee of []?

2. In what ways has the committee supported orchid research in the past?

3. Is the committee aware of Lankester Botanical Gardens' current activities, including ecotourism?

4. What is the committee's experience with Lankester Botanical Gardens, in terms of collaboration or with ecotourist activities?

5. Is the committee aware of plans for the growth and promotion of LBG's ecotourist programs in the near future?

6. Briefly, what does the committee perceive are the strengths of Lankester Botanical Garden's ecotourist programs and services? What does the committee perceive as LBG's primary weaknesses in this area?

7. Please rate the current quality of the following areas of LBG, and please briefly explain why:

	Excellent	Above Avg.	Avg.	Below Avg.	Poor
Ecotourist programs	1	2	3	4	5
Educational programs	1	2	3	4	5
Communications	1	2	3	4	5
Archive /collections display	1	2	3	4	5
Internet / Website	1	2	3	4	5
Conferences	1	2	3	4	5

8. Please prioritize the following improvements LBG would need to be more appealing to your committee, and please briefly explain why:

	Urgent	important	slightly important	not important
Ecotourist programs	1	2	3	4
Educational programs	1	2	3	4
Communications	1	2	3	4
Archive /collections display	1	2	3	4
Internet / Website	1	2	3	4
Conferences	1	2	3	4

9. Would your committee be interested in forming a stronger partnership with LBG? What additional services and programs would it like to see from LBG in order to make it a more attractive orchid-conservation partner?

Thank You!

Appendix J – Survey for Other Orchid Conservation Societies

Dear []:

Greetings. We are two students from Worcester Polytechnic Institute, Worcester, MA, USA: Raquib Mazumder '03 (Biology/Biotechnology major), Lauren O'Connell '04 (Mechanical/Aerospace engineering major). We are conducting an undergraduate research project that consists of developing a prospectus for Lankester Botanical Garden (LBG) in Costa Rica. We are currently working with LBG in order to effectively analyze how LBG's collaborators perceive the strengths and weaknesses of LBG. A Masterplan for LBG has been drafted in order to set out the development and expansion of LBG over the next 10 years. We are interested in [organization's] views about LBG.

We are asking the [org.] to participate in our short survey based on its knowledge of LBG and its future expectations of LBG's services. We will be analyzing the input for use in the development of LBG's prospectus. Any input your organization gives will be very helpful. All information (including names, organization, and location) will be kept confidential for the sole use of our study. This input will help us design LBG's prospectus based on what your organization believes should be planned for future construction and activities at LBG.

The survey is attached to this email as a Word Document and is also available at the following URL: http://users.wpi.edu/~r_mazum/iqp/lankester.doc . Please return this questionnaire by emailing r_mazum@wpi.edu, before June 19, 2002, so we will have adequate time to analyze your response. If you have any trouble accessing the survey either way, please email r_mazum@wpi.edu as soon as possible. Again, your opinions are very important to us. If you have any additional comments or suggestions for the improvement of services or collections at LBG, please do not hesitate to email us.

Thank you very much for your time.

Sincerely,
Raquib Mazumder (r_mazum@wpi.edu)
Lauren O'Connell (laurenoc@wpi.edu)

[org survey]: All information (names, location, and organization) will be kept completely confidential.

Please answer questions 1-6 in a few sentences:

1. What is the main focus or mission of your organization?

2. In what ways has your organization supported orchid research or conservation in the past?

3. Is your organization aware of Lankester Botanical Gardens' current activities, including ecotourism?

4. What is your organization's experience with Lankester Botanical Gardens, in terms of collaboration or with ecotourist activities?

5. Is your organization aware of plans for the growth and promotion of LBG's ecotourist programs in the near future?

6. Briefly, what does your organization perceive are the strengths of Lankester Botanical Garden's ecotourist programs and services? What does it perceive as LBG's primary weaknesses in this area?

7. Please rate the current quality of the following areas of LBG, and please briefly explain why:

	Excellent	Above Avg.	Avg.	Below Avg.	Poor
Ecotourist programs	1	2	3	4	5
Educational programs	1	2	3	4	5
Communications	1	2	3	4	5
Archive /collections display	1	2	3	4	5
Internet / Website	1	2	3	4	5
Conferences	1	2	3	4	5

8. Please prioritize the following improvements LBG would need to be more appealing to your organization, and please briefly explain why:

	Urgent	important	slightly important	not important
Ecotourist programs	1	2	3	4
Educational programs	1	2	3	4
Communications	1	2	3	4
Archive /collections display	1	2	3	4
Internet / Websites	1	2	3	4
Conferences	1	2	3	4

9. Would your organization be interested in forming a stronger partnership with LBG? What additional services and programs would it like to see from LBG in order to make it a more attractive orchid-conservation partner?

Thank You!

Appendix K – Copy of Prospectus (report version)

Lankester Botanical Garden
Prospectus 2002

Executive Director.....Sr. Jorge Warner
jwarner@cariari.ucr.ac.cr
Director of Research..... Prof. Franco Pupulin
fpupulin@cariari.ucr.ac.cr
Academic Director.....Dr. Carlos Morales
oldem@biologia.ucr.ac.cr

Tel: +011 506-552-3247
Fax: +011 506-552-3151

c/o University of Costa Rica
Apdo. 1031-7050 Cartago, Costa Rica, A.C.

Visit LBG's homepage: http://

Lankester Botanical Gardens is internationally recognized for its vast collection of epiphytes and its outstanding orchid collection.

Founded in 1973 and donated to the University of Costa Rica, Lankester Botanical Garden is named after an English naturalist, Charles H. Lankester, in remembrance of his love for Costa Rica and his dedication to collecting epiphytes for the garden.

LBG promotes conservation, enjoyment, and the sustainable use of epiphytic plants, especially orchids, through research, horticulture, and environmental education. We are currently seeking researchers in areas of interests to the garden. Such research can be carried out in cooperation with other international scientific and educational institutions with whom LBG is affiliated.

LBG is located in Cartago, the heart of Costa Rica. This central location provides an enormous biodiversity and easy access to most field sites. According to the Orchidaceae of the Neotropics, there is more biodiversity in Costa Rica per square meter than any other country in the world. The favorable climate and elevation of Cartago promotes cultivation of most Costa Rican orchids at LBG.

LBG is home to over 3,000 species of plants, 1,100 of which are orchids. With the largest collection of orchids in Central America contained in 10.7 hectares, LBG has the goal of becoming the Mesoamerican Center for Orchid Research and Taxonomy.

Experience in Research

- LBG research currently involves identification and classification of orchid species which grow in Costa Rica.
- A noteworthy laboratory facility includes a Micropropagation area, which has reproduced and distributed to the public more than 20,000 plants from 40 rare endangered species.
- The Orchid Identification Center provides a valuable service to orchid lovers and scientists. It is the only one of its kind in Latin America.
- LBG has excellent equipment and facilities for taxonomy, including a dissecting microscope with a drawing tube and camera attachment.
- LBG collaborates with the University of Florida on DNA research.
- Since 1988, researchers and associates have published more than 100 scientific articles in international journals with a strong emphasis in fields of taxonomy and epiphytic plant ecology; many were presented at international conferences.
- Some large botanical projects have included Flora Costaricensis and Flora Mesoamericana.
- Researchers have carried out research projects with other departments of UCR, such as Molecular and Cellular Biology Research Center and the Department of Biology. Projects included areas such as virology in cultivated orchids.
- LBG researchers are consultants for the IUCN and coordinate the group of experts on Mesoamerican orchids.
- LBG is the scientific authority for CITES.
- The library is expanding and fully supportive of research activities.

Publications

- *Lankesteriana*:
  Edited by Dr. Carlos O. Morales and Prof. Franco Pupulin
  This is the scientific journal of LBG and U.CR, devoted to the publication of articles on botany, with a special emphasis on epiphytic botany and orchid systematics, ecology, evolution, plant physiology, as well as reviews of books and conferences on these topics. The journal is internationally recognized for its high publication standards.

- *Epidendrum:*
  Published since Oct. 2001, edited by Prof. Franco Pupulin.
  This is a news bulletin of LBG, for plant lovers and the general public, proven to be a valuable asset. This bulletin disseminates news of the garden's research and collections to all orchid lovers. It reinforces the garden's image as one of the leading institutions in orchid research.

Conservation

LBG receives more than 20,000 tourists per year who come from many parts of the world to observe LBG's collections of plants and enjoy the beauty and the tranquility of the garden.

LBG actively participates in orchid exhibitions throughout the country, by means of plant exhibitions and educational programs dedicated to promoting the sustainable cultivation and conservation of orchids.

LBG's collections in the outdoor areas of the garden were cultivated using scenic criteria, which makes LBG attractive for visitors.

LBG cultivates endangered orchids confiscated by inspectors of the Department of Wild Life, Ministry of Natural Resources. In the last eight years, more than 5000 plants have been successfully cultivated in greenhouses.

LBG possesses 2.5 kilometers of pathways very accessible by people with physical disabilities.

The *Epidendrum* list new species of various orchids cultivated by LBG.

Education

LBG has been an informal education center in Costa Rica in the fields of botany and conservation. More than 500 adults and almost 10,000 children visit LBG annually. Here they learn basic concepts of conservation and how to use natural resources through courses and guides.

LBG has played an important role in the education of tour guides and inspectors of wild life and flowers, to whom they offer specific courses.

LBG has worked together with the School of Continuing Education of U.CR in the development of innovative educational activities.

Currently there is one course for field researchers and one course for orchid growers and lovers.

LBG's library continues to grow and many new titles through the exchange with *Lankesteriana* are being acquired.

Major Scientific Events Sponsored by LBG

In 1998 an LBG workshop directed by la Unión Internacional para la Conservación de la Naturaleza (IUCN) discussed an orchid conservation plan. They confirmed 80

endangered species of orchids were at high risk of extinction and planned to develop and promote a conservation strategy through the sustainable use of Costa Rican orchids.

In 1999, The Mesoamerican Seminar of Orchidology and Conservation built upon the 1998 workshop. This seminar initiated conservation programs to stimulate research, education, sustainable use, and adequate cultivation of orchids.

In 2001, The 2nd Mesoamerican Seminar involved researchers worldwide in areas of orchid phylogeny, taxonomy, genetics, regional conservation, and cultivation. Other activities at this seminar included a National Orchid Show, a Photographic Contest, artwork, and Orchid Books Exhibitions, etc.

In May of 2003, LBG will organize the International Congress of Orchidology Neotropical.Seminar, which will involve the Conference of Mesoamerican Orchid Specialists. The goals of the congress are to address phylogenics, population biology, propagation, germplasm storage, taxonomy, genetics, cultivation techniques, in situ and ex situ conservation, and education, among others.

Future Goals

LBG is currently planning a Capital Campaign to fund the following. We welcome inquiries about the following proposed activities:

Facilities & Centers

- Construction of an orchidarium to exhibit LBG's epiphytes and demonstrate LBG's role as the leading epiphyte conservation and research center. It is expected that the orchidarium will host the main activities of LBG and will become internationally-known.
- Construction of a visitors room so visitors can understand LBG's unique role and activities
- Construction of a cafeteria and giftshop for visitors and researchers
- Upgrade of office and laboratory space to accommodate more personnel
- Upgrade of the research infrastructure
  -- A new research building, a herbarium annex, and housing for visiting researchers
- Creation of seed bank of endangered neotropical orchids
- Amplification and improvement of the in vitro propagation laboratory
- Establishment of a Center of Documentation for Mesoamerican Orchids
- Creation of a children's area, auditorium, and classroom for 50 students
- Construction of new nurseries (~1000 m^2) for plant collections to promote plant material exchange with other research institutions
- Construction of new nurseries (~1000 m^2) for commercial plant reproduction used to generate economically resourceful products

Activities & Programs

- Studies about the recuperation of Costa Rican forests; use of own secondary forest for long term studies of epiphyte establishment and reproduction
- Improvement of inventory, taxonomy, and horticulture of native Costa Rican orchids
- Discovering regional flora and inventorying epiphytic plants in national parks
- Collection, taxonomy, and horticulture of non-orchid epiphytes
- Creation of a Department of Environmental Education through U.CR
- Courses for graduate students in orchids and epiphytes
- Advanced courses for orchid lovers in orchid collection
- Continued organization of Mesoamerican Seminars
- Attracting national and international student volunteers to the garden
- Increasing both the quality and quantity of research, as well as size of research staff

In order to integrate people of Cartago more effectively in the work of the garden, LBG plans on hosting cultural activities directed towards the local public. LBG will collaborate with the School of Music, Drama and Arts, and the Fine Arts programs at the University of Costa Rica to become more involved with the local community, through, for example, outdoor concerts.

Appearance

- Improving garden maps and trails
- Enhancing informative descriptions of species in the garden
- Creating a corporate image to selling related products and communicating the activities of LBG; public advertising
- Labelling plants accurately to provide useful information
- Improving garden security

Literary Publications

- The publication of *Epidendrum* twice a year and the sale of an Orchid Almanac

- The sale of a series of three books entitled Belleza en extinction: Orquideas de Costa Rica for the general public and orchid lovers, containing many pictures of orchids native to Costa Rica. Underneath the pictures there will be captions describing the orchid and information specific to that species of plant.

- The sale of Cien Orquideas de Costa Rica, mostly for tourists. This book will give a history of Costa Rican orchids and describe the distribution of orchids throughout the country. It will contain one hundred and thirty high quality photographs and will be published in both Spanish and English.

- The sale of a guide to LBG, Un Mundo de Plantas. The guide will contain historical facts and information about LBG's activities and collections. Not only will this guide serve as an aide to visitors of the garden, but it will also convey information about LBG to the general public.

- *Icones Plantarum Tropicarum*
  Initially published at Marie Selby Botanical Gardens and Missouri Botanical Gardens. It is composed of 15 volumes describing the flora of neotropical orchids. LBG now has the opportunity to edit new volumes using its scientific resources and staff with artistic abilities.

Current and Past Collaborators of LBG

Royal Botanical Gardens, Kew, Jodrell Laboratory
Missouri Botanical Garden
Marie Selby Botanical Garden
University of Florida, Gainesville
Cleveland Botanical Gardens
Instituto Nacional de Biodiversidad (INBio)
Field Museum of Natural History, Chicago, USA
Worcester Polyechnic Institute, Worcester, USA
Herbario Nacional, Museo Nacional
University of Puerto Rico
University of San José
University of Costa Rica, Department of Biology, Cell and Molecular Biology Research Center, Faculty of Microbiology
Ministry of Environment and Energy, Costa Rica
Universidad Autonoma de Mexico
Esceula Agricola de la Region del Tropico Humedo (EARTH)
Dr. Rafael Ma. Moscoso National Botanical Garden, Dominican Republic
Reserva Valle Escondido
Instituto Nacional de Cancerologia, Mexico
Unidad de Biotechnologia y Prototipos Universidad Nacional Autonoma de Mexico
Universität Ulm, Germany
Asociación Guatemalteca de Orquideologia
Harvard University Herbaria
Universidad Autonoma de Chiriqui
Group Talleres de Belgrano, Argentina
Direccion General de Ensenanza Technologica Agropecuaria, Mexico
Trinidad and Tobago Orchid Society
San Diego County Orchid Society Conservation Committee
Asociacion Costarricense de Orquideologia
University of Bonn
Universidad del Valle de Guatemala
OSG Ex Situ Conservation Committee
Centro Nacional de Investigaciones de Café (CENICAFE), Colombia
Gaia Botanical Garden
Organización Productores de Orquideas (OPO)

Universidad Nacional
UICN Orchid Specialist Group
Orquideario Soroa, Cuba
Instituto de Ecologia, UNAM, Herbario AMO
Ministerio de Cienca Tecnologia y Medio Ambiente, Cuba
Asociación Alajuelense de Orquideologia
American Orchid Society

Lankester Botanical Gardens
Tel: +011 506-552-3247
Fax: +011 506-552-3151
c/o University of Costa Rica
Apdo. 1031-7050, Cartago, Costa Rica, A.C.

Appendix L – Copy of Website Outline (report version)

Versión en Español [link]

Universidad de Costa Rica

Jardín Botánico Lankester

About LBG
Visitor Information

What's New

***LBG in focus* (scr**

Friends of the Garden

Research

Education

Conservation

Campaign for LBG!

Search Engine

About LBG

Contact Information & Staff Directory

Garden Overview

LBG Highlights & Fact Sheet

The History, Mission, and Vision of LBG

The Decade Masterplan of LBG

The LBG Prospectus

Visitor Information

Directions

Regional Information – About Costa Rica
Current Weather Conditions

Membership Information
For Visitors

Admissions

Donations

Tourist Services

Contact Information

Universidad de Costa Rica
Jardín Botánico Lankester

What's New

Press Release
news about LBG, important discoveries, etc, interesting developments, etc.

Calendar of Events
Upcoming events, weekly and monthly schedule of events

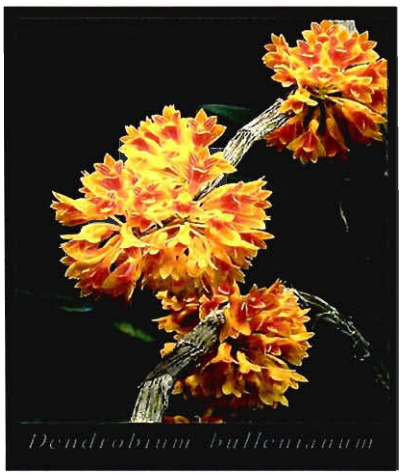
Special Events
Conferences, weddings, special concerts or art events, etc.

Events Diary
e.g.: 2001 Mesoamerican Seminar on Orchidology and Conservation

Friends of The Garden

Why Contribute?

Friends of Lankester Botanical Garden
- links to collaborators



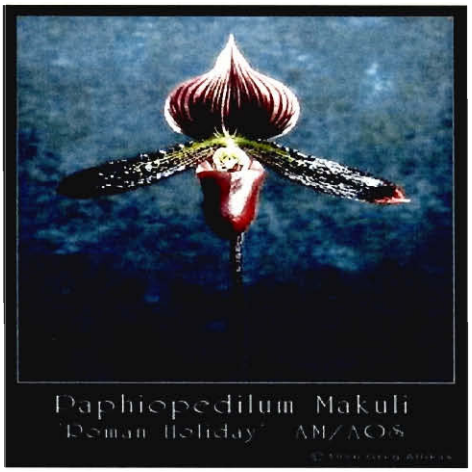
Membership & Partnership Information (Web sign up)

Benefits of Membership
-events, discounts, recognition, etc.

Donating to LBG
-You can make a difference!

Shops & Services
-Purchasing publications or books (online?)

Capital Campaign
- information on all wishlists; describe various donations possible, describe masterplan and vision as well as construction projects that require donations
-see separate page



Research and Publications

General Information

-research staff, current and future goals and prospects

Current Programs & Noteable Projects

-those that have made a difference

Centers & Research Facilities

-position vacancies, description of collaborations, activities, and aspirations

- description of all facilities used for research, including propagation lab, seed flasking, etc.

Library

-Collections, titles, general development

Database & Identifcation

- What's new

Press & Publications

- new research, discoveries

-description of Lankesteriana, link to several articles

-description of Epidendrum, link to material

Wishlist

-equipment, funding, endowed positions, facilties, etc.

provide link to capital campaign here; explain why would like funding for what building projects

Applied Research & Science

-how is LBG's research applied to the practical world?

Research Opportunites at LBG

-open positions for researchers or scholars

Education & Horticulture

Goals & Objectives

Orchid Courses & Programs

Graduate & Continuing Education Programs

Kids Programs

-games online
-activities at Garden

Information & Resources about Plants

-describes each plant species for general public

Current Educational Facilities & Wishlist

- endowed professorships at LBG
- classrooms
-equipment for auditorium
-plans to enhance educational facilities

Internship & Volunteer Opportunities

-for students and Cartagans alike

Environmental Conservation Training

-for general public, geared to teaching sustainable use of orchids (both current and future plans)

Library

- educational resources

Conservation & Collections

Collections of LBG

Conservation Programs

Newsletters

-online version ofepidendrum, goals, future prospects, how it promotes conservation

Training for Conservation

-courses, general info, planned activities, etc.

Useful Conservation Links

-links to other sites which promote or teach conservation

Universidad de Costa Rica
Jardín Botánico Lankester

The Capital Campaign for LBG [similar to prospectus]

The Garden Today
-describe LBG's unique role
-summarize accomplishments to date

How to Participate
-describe ways of contributing, levels of contribution and sizes of gifts

Campaign Staff
-who is involved in running campaign
-who collaborates with LBG

A New Vision

-explain LBG's desire to become Mesoamerican Center for Epiphyte Taxonomy

-attract epiphyte scholars from around the world develop facilities and visibility as leading orchid institution

Building The Epiphyte Center of Tomorrow

-develop list of how much money will go where
-describe individual objectives
-how endowments and donorship will assist
-provide link to prospectus

News and Progress

-news of gifts or donations, make pie chart of progress

-any news describing LBG's potential

Appendix M – Organizational Growth and Management

Lately, competition has driven many organizations to eliminate many of their branches, or "flatten" themselves (McConnell, 1998, p. 73). Flattening is when the organizational structure shrinks through removal of layers in the hierarchy. Normally, flattening occurs after growth of the organization. Layers and functions are normally added because of a perceived need for a particular function or activity, or because of a perception that more work needs to be done. In some educational-related organizations, expansion occurs due to increased accreditation demands. Most new positions add substantial benefit to customers and the organization itself. Positions that do not have an impact on revenue are not typically justified. In response to tough times and shrinking bottom lines, it becomes harder to logically justify the addition of managers or staff support people. However, nonprofit organizations are able to grow easier and faster than for-profit organizations. Thus, once LBG is marketed and promoted to outside audiences properly, it will have to apply proper management techniques to grow successfully.

Surviving the flattening phenomenon requires being able to "change with the times" (McConnell, 1998, p. 82). This involves learning new processes, taking on different responsibilities, handling more employees, and managing unfamiliar activities. Furthermore, versatility, flexibility, and adaptability are some required traits of a successful manager of a growing organization such as LBG.

Nonprofit organizations are not permitted to issue shares of stock and do not provide shareholders with dividends from profits received from their operating business (WhiteHat, 1999, p. 15). The surpluses obtained by a nonprofit organization are used primarily to operate and maintain the organization, not to directly benefit its members.

There exist three kinds of nonprofit organizations: funding agencies, membership organizations, and service agencies. Lankester Botanical Gardens can be considered a service agency. The basic distinction between a profit and non-profit organization is its organizational purpose (Anthony & Herzlinger, 1975, p. 2). Anthony & Herzlinger further categorize nonprofit organizations into client-oriented, member-oriented, and public-oriented (p. 57). LBG is currently considered a public-oriented organization. However, it is also striving to become a member-oriented organization, that is, one which attracts groups and individuals to share its services.

Management control is the process by which managers assure that resources are obtained and used effectively and efficiently in accomplishing the organization's objectives (Anthony & Herzlinger, 1975, p. 2). Thus, proper management control is essential in the implementation of the LBG masterplan and communicating its strengths to constituents. Some, but not all, techniques of control are applicable to both profit and nonprofit organizations. The objectives of a nonprofit organization are to provide the best possible service with the available resources. The success of such an organization should be measured by how much service is rendered and by how well it is rendered. An example of a service would be the organization's contribution to public welfare or knowledge. One view expressed by Anthony & Herzlinger is that if a nonprofit organization consistently has a surplus of funds, it is not accomplishing the objective of providing as much service as possible with the available resources, and it should thus provide more service or reduce prices. However, according to Whitehat, "profit" may be acquired, but it must be utilized to enhancing services and not for personal gain.

The total system of organization, or management control system, should consider the needs of several parties (Anthony & Herzlinger, 1975, p. 79). In particular, the control system needs to consider the needs of those whom the LBG masterplan will benefit. Top managers need information for making policy decisions and balancing programs. Planners and analysts need information that will assist in estimating the benefits and costs of programs. Operating managers need information classified by responsibility centers, which exercise control. Outside agencies can require certain information, and the system must be designed so that it accommodates this information. Some of this information must be furnished to the public. There must be a balance, in the system, between the users' needs for information and the cost of collecting and processing the information (Anthony & Herzlinger, 1975, p. 79).

In a nonprofit organization, the prices charged for services rendered are an important consideration in management control (Anthony & Herzlinger, 1975, p. 79). The five general principles of pricing, according to Anthony & Herzlinger, include 1) selling services as opposed to giving them away, 2) allowing the price to affect consumer's actions, 3) making the price equal to the full cost, 4) having the unit of service that is priced be narrowly defined, and 5) understanding that prospective pricing is preferable to cost reimbursement. A primary advantage of selling services as opposed to giving them away is that it increases the client's awareness of the value of the service. This is essential for LBG to market its services, such as courses for students or products for tourists.

There are many advantages in the decision to incorporate an organization such as LBG (Whitehat, 1999, p. 16). However, the decision must be made before the

organization becomes large and complex and obtains large amounts of revenue. First, the personal assets of the director are no longer at risk. Many corporations, such as scientific, charitable, and educational institutions, are will not need to pay taxes. The organization continues to function regardless of a change of leadership, giving the organization a form of "immortality." Furthermore, the public is more willing to associate with large, incorporated institutions (Whitehat, 1999, p. 16).

There are also disadvantages to incorporation, namely, loss of centralized control, time and resources in preparing the Articles of Incorporation, finding the right people to serve on the board of directors, and hiring qualified staff. In general, time can be wasted as decisions take longer to analyze. Being small limits what an organization can accomplish; however, less time and energy are wasted. If it is essential to maintain complete control of the organization, and if it is possible to keep the scale of operations small, then incorporation should be avoided (Whitehat, 1999, p. 19).

The procedure for incorporation begins with contacting someone who runs a nonprofit organization of similar size and type and asking questions about paperwork requirements, office equipment, rental space, and benefits or pitfalls (Whitehat, 1999, p. 20). Then, potential incorporators and board members should be identified who are accessible and can possibly contribute to the organization. Additionally, experienced fundraiser volunteers who are knowledgeable about issues in the organization should be contacted. Incorporators are persons legally responsible for forming the corporation. Legal status confers on the incorporators to take actions in the best interest of the corporation and not in their own personal interests. The incorporators must be approved by the board of directors. Finally, once the Articles of Incorporation are filed and

approved, it must be made sure that all actions support the whole corporation and not just individuals. Incorporation may be an option for LBG if the University of Costa Rica finds itself overburdened with the task of funding and supporting LBG.

The most important quality indicator of a non-profit organization is the people who work within it. The people include staff, volunteers, and other workers, who help establish a tone, help define the organization's image, and determine the effectiveness with which the organization carries out its mission, its programs, and its activities (Wolf, 1990, p. 80). LBG should strive to maintain and nurture a pleasant, well-trained staff.

In order to attain a well-managed and harmonious organization, and thus to become a well-respected institution, a nonprofit organization must assemble "guardians of the public trust" (Wolf, 1990, p. 29). These "guardians" are the trustees. They are expected to serve the organization without compensation, and they are expected to carry out their duties as volunteers for the public good. Their mission is to ensure that the organizations they serve are carrying out their goals as articulated in the "articles of incorporation" and that that their activities are within legal bounds. Being a trustee requires knowledge, commitment, and time, and is a serious business carrying legal obligations. The duties of trustees include setting policies for their organization's operation, setting the overall program for the organization's year to year activities, establishing fiscal policies and bounds, and providing adequate resources for the activities of the organizations. Additionally, trustees select the chief executive of the organization and determine their expectations for his or her performance.

There are several challenges included with organizing and assembling a workforce. Since LBG is interested in increasing the size of its research activities and staff after

successful marketing, several questions must be addressed (Wolf, 1990, p. 60). First, should candidates who are bright and are able to learn fast be favored, even if they are inexperienced? Should people be hired because their experience matches the expertise of the organization, even if the position in that field is not open? Should the organization favor individuals with advanced training, such as a Ph.D., even if the training is in an unrelated field? And lastly, should the organization even consider a person without administrative training even if the position is management-related? More often than not, the answer to these questions is "no." Additionally, organizational parameters must be addressed, such as determining specific tasks and distributing them among salaried employees, volunteers, independent contractors, and outside organization service providers. Training and orientation of personnel must also be taken into account.

There are several important aspects of large organizations which set them apart from smaller ones (Lakey, Napier, et al., 1995, p. 62). In a large organization, known as a "secondary system," there are more objectivity, immediate accountability to a coordinator, and clear rules and procedures. In a smaller organization such as LBG, also known as a "primary system," workers are more friendly, informal, and everyone is held accountable to the whole. At LBG, growing from a primary to a secondary system will require much planning and adjustment to change. A task force must be organized to explore various structures of organization. Nevertheless, an important factor in the success of an organization is the satisfaction of its employees, so a smooth transition is important.

Appendix N – Website Homepages of Seven Other Gardens

(Please also see Kew Botanical Gardens in Chapter 4, p. 63)

ROYAL BOTANIC GARDEN EDINBURGH

Welcome to the
Royal Botanic Garden Edinburgh

News	Collections	Publications	Associated orgs.
Introduction	Research	Events	Searchable data
Visitor Info.	Education	Staff	Other Sites

Search the RBGE website index for keywords of interest

Keywords [ ] Submit Query Reset

[Help]

- **NEWS**
  News from the Garden
- **INTRODUCTION**
  An introduction to RBGE and its Specialist Gardens (**Younger**, **Logan** and **Dawyck**), plus its **Remit and Mission Statement**
- **OPENING TIMES/VISITOR INFORMATION**
  Information for the visitor to RBGE and its Specialist Gardens
- **COLLECTIONS**
  Details of the Garden's world-famous collections of living and preserved plants, its **Library**, ***BG-BASE***™ – its collections management database, and a searchable index to its living plant collections
- **RESEARCH**
  An insight into the scientific research carried out by RBGE staff
- **EDUCATION**
  Details of RBGE's horticultural, postgraduate and public, adult and schools education programmes
- **PUBLICATIONS**
  The **Publications Catalogue** and selected publications by staff, plus details of the ***Edinburgh Journal of Botany***
- **EVENTS AND EXHIBITIONS**
  Details of events and exhibitions taking place at the Garden
  - **INVERLEITH HOUSE**
    Details of past, present and future exhibitions, plus the history of the House and background to its involvement in art and science
- **ORGANISATIONS AND SYSTEMS** ASSOCIATED WITH RBGE
  Flora Celtica; **Friends of the Royal Botanic Garden Edinburgh**; ***BG-BASE***™; **PANDORA**; **PlantNet**; the **International Organisation for Plant Information**; **Science and Plants for Schools**; the **Botanical Society of Scotland**; the **British Bryological Society**; **Edinburgh Centre for Tropical Forests**

- SEARCHABLE DATA AVAILABLE AT THIS SITE
  - **Catalogue of the RBGE Living Collections**
  - **Database of the *Flora Europaea***
  - **Gazetteer of East Himalayan Plant-Collecting Localities**
  - ***Dipterocarpaceae* Database**
  - **DIADIST - Diatom & Desmid Identification**
  - **Zingiberaceae Resource Centre**
  - **Inter-Institutional Living Collections Search Interface**
- **STAFF DIRECTORY**
  E-mail addresses and extension numbers for scientific staff and selected departments
- **OTHER SITES OF BOTANICAL/HORTICULTURAL INTEREST** (maintained by the Royal Botanic Gardens Kew)
- **USEFUL LINKS**
  Including websites with reciprocal links to the Garden's.

Please send your comments and suggestions to: Webmaster@rbge.org.uk,
or sign the Guest Book

Royal Botanic Garden Edinburgh, Inverleith Row, Edinburgh EH3 5LR, United Kingdom
Tel +44 (0)131 552 7171 ~ Fax +44 (0)131 248 2901

Fig. 4.2 Royal Botanical Gardens, Edinburgh, Website Homepage (www.rbge.org.uk)

THE NEW YORK BOTANICAL GARDEN

Spring Online Tour

This Week in the Garden

Science

Membership

Library

Educational Programs

Family Events

Shop in the Garden

Press Room

Garden Overview

Visitor Information

Volunteering

Patrons Program

Seasonal Events

- NEW: Seasonal Farmers Market
- Exhibition: *Victorian Ornamentals*
- Exhibition: *Sculpture from The Museum of Modern Art at The New York Botanical Garden*
- Exhibition: *Plants and Gardens Portrayed: Rare and Illustrated Books from The LuEsther T. Mertz Library*
- In Celebration of Plant Science
- Events Calendar
- Exhibitions and Shows 2002

What's New

- Upcoming Hearing on the Fordham Tower
- Garden Cultivates Rare, Award-Winning 'Perfect' Orchid
- Garden Announces Grand Opening of New Plant Research Facilities
- Garden Inaugurates New Exhibition Gallery

Plant Information

- Gardening Tips
- Plant Information
- Plant Information Fact Sheets
- Composting
- John Suskewich's Books & Plants Column

Science

- Searchable Databases
- The Virtual Herbarium of The New York Botanical Garden
- An Herbarium specimen explained
- New York Botanical Garden Press

The New York Botanical Garden
Bronx River Parkway at Fordham Road
Bronx, New York 10458
(718) 817-8700 For plant information, contact pltinfo@nybg.org
For Adult Education information, contact conted@nybg.org
For events information, contact Public Relations

Fig. 4.3 NYBG Website Homepage (www.nybg.org)

Fig. 4.4 MBG Website Homepage (www.mobot.org)

Fig. 4.5 CBG Website Homepage (www.chicago-botanic.org)

Fig. 4.6 MSBG Website Homepage (www.selby.org)

Fig 4.7 CBG Website Homepage (www.cbgarden.org)

Environment Australia | The Australian National Botanic Gardens is part of Environment Australia

Australian National Botanic Gardens

Growing, studying and promoting Australia's flora

GPO Box 1777
Canberra
ACT, 2601
AUSTRALIA
Tel: 02 - 6250 9450

About the Botanic Gardens (open daily 9am-5pm, extended to 8pm in January and February)		
An introduction to the **Australian National Botanic Gardens** (ANBG) [en Français] 中文 [Esperanto]		
A walk along the Main Path.	The Display Glasshouse	Coming events and attractions
Plants in the Gardens	In Flower this week	Horticultural research
Animals in the Gardens	Education	Botanical Research
The Botanical Bookshop	Public Reference Herbarium	The Gardens' Library
Friends of the Gardens	Memorials in the Gardens	History of the Gardens
Facilities for hire and booking	Maps of the Gardens	Administration
Positions vacant	Recent media releases	Annual Reports - Management Plan

About Australian Plants		
Photographs of Australian plants	Plant names	Botanical statistics for Australia
Aboriginal uses of native plants	Growing Australian plants	Rare or threatened plants in Australia
Floral Emblems of Australia	Botanical art	Booklists on Australian plant topics
Botanical information for botanists	Federation Flora	Registered cultivars
Environmental Weeds	Australian ferns	Plant collectors and illustrators

Other Botanic Gardens and relevant links		
Council of Heads of Australian Botanic Gardens (CHABG)	Other botanic gardens managed by the federal government	Botanic gardens management issues
Directory of Australian Botanic Gardens and Arboreta	Australia-wide botanic gardens projects	Australian Biological Resources Study - *Flora of Australia*
Clubs and societies interested in Australian native plants	Supply of seeds of Australian plants	Australian regional information

Search or browse below....

Administration and affiliated agencies

- The ANBG's scientific section and herbarium, the Centre for Plant Biodiversity Research (CPBR)
- The ANBG's community support group, Friends of the Australian National Botanic Gardens
- The Botanic Gardens is part of the Federal Government's 'Environment Australia'
- The government department to which it belongs is Dept of the Environment and Heritage
- History of the ANBG's administration.

***Coming events and attractions**

Details from the Visitor Centre 6250 9540

- **Current Visitor Centre Exhibition** - Shades of Eucalyptus - fabric dyes from eucalypts.
- Visit the Display Glasshouse - open 10am to 3am daily, accessable from the Main Path.

In Flower this Week

- In Flower This Week at the Gardens - updated each week by a volunteer.
- View past issues of 'In Flower This Week'.

Education - information for students and teachers

- ANBG Education Service - a natural learning experience.
- Teachers Resources - to download before a visit to the Gardens.
- Floral Emblem Education Kit - resources for the Centenary of Federation
- Herbarium Internship Program for tertiary students.
- Plant Enquiry Service
- **'Discover...' series** - booklets for students (adapted for the internet)
  - How to Propagate Native Plants
  - The Plant Kingdom
  - Some Australian Plant Families
  - Aboriginal Plant Use in South-Eastern Australia
  - Frogs with sound, (1238 K); Frogs without sound (39 K)
  - Conifers in the Gardens

Plants in the Gardens

- Find a living plant in the botanic gardens - access our database..
- Find herbarium specimen information (registered users only - contact anhsir_query@anbg.gov.au to register).
- Collection or removal of plants from the Gardens - application for permit.

Plant names

- Find the correct name for an Australian plant - What's Its Name? 

including recent name changes.
- Find information about the names of Australian plants. (botanical names, common names, and cultivars)
- Find information about the scientific publication of plant names worldwide - International Plant Names Index (IPNI).

Photographs

- **Find records of plant photographs.**
- About the photograph collection and its use (and purchasing photos).
- Search by plant family for digitized images from photograph collection. ('non-'frame' version).
- Australian plant images taken with a digital camera.

Maps

- The location of the ANBG in relation to Canberra's city centre, university and CSIRO.
- Coloured map of the Gardens - [large file 629K]
- Detailed maps of the ANBG showing section numbers and buildings.

Growing Australian Plants

- **'Growing Native Plants'** - a selection of horticultural plant profiles.
- Basic tips on propagating Australian plants an educational 'booklet' for students.
- Wattles (genus *Acacia*) in the ANBG and your garden, with photos.
- Tea-trees (genus *Leptospermum*) for Australian gardens, with photos.
- Kangaroo Paws (genus *Anigozanthos*) for your garden.
- Banksias - (genus *Banksia*) for your garden.
- Waratahs - (genus *Telopea*) for your garden.
- A new waratah cultivar *Telopea* 'Braidwood Brilliant'.
- Bottlebrushes - (genus *Callistemon*) for your garden.
- *Helichrysum* 'Helping Hand' - a cultivar for the International Year of Volunteers.
- Growing Australian native ferns in cool climates. Other fern info.
- Native Climbing Plants for Australian gardens.
- Information on Wollemi Pine (*Wollemia nobilis*) from the Royal Botanic Gardens, Sydney.

Horticultural Research

- Application for permits to remove plants from the Gardens or for research projects in the Gardens.
- Report on ANBG's Horticultural Research Program - February 1996.
- List of registered cultivars of Australian native plants.
- Native Grass Restoration in the Australian Capital Territory Water Catchment - by Iain Dawson and Susan Winder.
- Grafting Australian Native Plants - a review of available data, by Iain Dawson.
- Plant Hardiness Zones for Australia - a review of the data and comparison with the US system, by Iain Dawson.
- Collecting, growing, and researching sub-Antarctic plants - Article 1, Article 2, Article 3, project report.

Animals in the Botanic Gardens

- Common birds within the Gardens, (with drawings and calls)
- Checklist of birds of the Gardens
- Mammals of the Gardens, with coloured illustrations.
- The Gardens' Bat Hotel, an article about research.
- Frogs (with sound, 1238 K), Frogs without sound (39 K), both with drawings and descriptions.
- Dragons in the Gardens.
- The Scribbly Gum Moth.
- The Common Brown Butterfly.

Facilities for hire or booking in the Gardens

- Forms to download to book indoor and outdoor venues and weddings.
- The Gardens' cafe - **Hudsons in the Gardens** Telephone: 6250 9465

Memorials within the Gardens

- Memorials, including plaques and named buildings.

Art Gallery of Australian flora

- Coloured illustrations of some Australian plants.
- Australian plants on postage stamps, illustrating all the stamps.
- Wattle 'nymphs' ! - art photography from 1921.
- The Waratah as an art motif in the early 1900's.
- New book on the history of botanical illustration in Australia.
- Christmas flowers - some background information and history

The Use of Plants by Australian Aboriginals

- Some plants used by Australian Aboriginals with drawings of the plants.
- Aboriginal Plant Use in South-Eastern Australia with drawings of plants and artefacts.

Floral Emblems of Australia

- Floral emblems of Australia, its States and Territories.
- Federation Flowers for States and Territories to celebrate Centenary of Federation 2001.
- Floral Emblem Education Kit - resources for the Centenary of Federation.

Rare or Threatened Plants in Australia

- A list of Endangered, Vulnerable or Extinct species, some with photos.
- Photographs of rare or threatened plants.

Other Commonwealth Government Botanic Gardens

- Booderee (Jervis Bay) Botanic Gardens
- Norfolk Island Botanic Gardens

Australia-wide botanic gardens and other horticultural projects

- Directory of Australian Botanic Gardens and Arboreta
- What is a botanic gardens?
- Census of Plants in major Australian botanic gardens
- List of cultivars registered with the Australian Cultivar Registration Authority (ACRA)
- Search the PBR database of plants registered for Australian Plant Breeders Rights
- Australian Plant collectors and illustrators - a catalogue with biographical links.
- Australian Botanic Gardens Forum the Council of Heads of Australian Botanic Gardens (CHABG)
- NSW Regional Botanic Gardens Network
- BGCI 5th International Congress on Education in Botanic Gardens, Sydney, Sept 2002
- Australian Network for Plant Conservation (ANPC)
- Australian Native Food Industry Website, administered by RIRDC
- Florabank a joint project between Greening Australia, CSIRO Tree Seed Centre, EA and ANBG.

Botanic gardens management

- What is a botanic gardens?
- ANBG Plan of Management - 2002-2007
- ANBG Biodiversity Conservation Policy - 1998
- Some resources on disaster preparedness from other institutions
- Collecting permits in Australia - contacts and regulations.
- Australian Plant Breeder's Rights administered by DPIE.

For the more serious botanist

- Botanical Research, Conservation, Management and Use of the Australian Flora:
  The Centre for Plant Biodiversity Research (CPBR) home page.
  The CPBR, including the Australian National Herbarium,
  combines the herbaria and research activities of both the
  Australian National Botanic Gardens and CSIRO Plant Industry.
- Application form for Permits to undertake botanical research in the Gardens.
- Council of Heads of Australian Herbaria.
- Botanical biodiversity of Australia, some statistics.
- How to collect plants for the Australian National Herbarium and Australian National Botanic Gardens.
- All about Australian and world ferns.
- Issues of Eucalypt taxonomy by Andrew Lyne.
- Eucalypt collaborative data set project
- Studies in the Genus *Leptospermum*
- Botanical or biological agencies in Australia
- Australian Systematic Botany Society
- Collecting permits in Australia - contacts and regulations.
- 'Flora of Australia' - a publishing project by ABRS.
- The Families of Flowering Plants by L. Watson and M. J. Dallwitz - plant family characters (external link).
- A Glossary of botanical terms.

Booklists on selected topics

- Bibliographies on a range of topics, prepared by the Botanic Gardens Library.
- Bibliography of plant identification prepared by Bob Makinson.
- A selection of botanical glossaries

The Botanical Bookshop

- About the Bookshop at the Australian National Botanic Gardens.
- A select list of books about Australian plants available from the Bookshop.
- Order form for books.

Supply of seeds of Australian plants

- CSIRO's list of Australian Suppliers of Tree Seed
- Florabank a joint project between Greening Australia, CSIRO Tree Seed Centre, EA and ANBG.

Links, Clubs & Societies interested in Australian plants

Our policy is to provide links only to sites who's primary topic is Australian native plants, or botanic gardens.

- Society for Growing Australian Plants (SGAP) home page.
- Australian Plants on-line, journal of the Society for Growing Australian Plants (SGAP).
- Australian Native Plant Society, Canberra Region, Canberra's branch of the Society for Growing Australian Plants.
- Australian Systematic Botany Society (ASBS) home page.
- Australian Network for Plant Conservation (ANPC) home page.
- The Nursery Industry Association of Australia, the peak body for the nursery trade.
- Australian Institute of Horticulture, the association for professional horticulturists.
- Botanical or biological agencies in Australia
- Links to environmental web sites in Australia and overseas.
- Helpful links to web sites relevant to Australian plants and their conservation

About the ANBG WWW server

- Information about the ANBG WWW Server

Database management in the Gardens

- About the Integrated Botanical Information System (IBIS)
- Information about the ANBG's databases.
- Herbarium data transfer standards - HISPID.

Australian regional information

- Canberra Tourist Information
- [About Australia] [About today] [Weather]

Search

Updated Tuesday, 18 June, 2002 , Murray Fagg (murray@anbg.gov.au)

Fig. 4.8 Australian National Botanic Garden Website Homepage (www.anbg.gov.au)

Appendix O – What is an IQP?

The Interactive Qualifying Project (IQP) challenges students to identify, investigate, and report on a topic examining how science and technology interact with societal structures and human values. The project we have completed is an IQP because it examines how the functionality of a scientific research center interacts with the needs of those using the research center. It also examines how the research center can and should benefit society, now and in the future. Throughout the project, we will attempt to identify social parties who will be interested in supporting the new LBG research center. The various social, academic, and philanthropic organizations have a common goal of promoting the awareness of epiphytes, as well as bringing new discoveries in the field of epiphytes or ecology into Costa Rica. Costa Rica is the ideal environment to develop a major center for studying epiphytes, because of its unique diversity. The native population of Costa Rica will be able to interact with the research center through the outreach programs which our project will recommend, thus extending the social-technological connection of this project even further. Finally, the economical aspects, management, and organizational structure of LBG are also part of a large social science element which must be examined in conjunction with the scientific aspect of developing a botanical research center.

Lankester Jardin - IQP task chart - E Term (5/11//02-7/4/02) -- Appendix P

Tasks	week1	week2	week3	week4	week5	week6	week7	week8
Orientation to CR/Agency	XX							
Spanish Lang. (1/2day classes)	XX	XX						
Initial presentation (of goals)	XX							
Draft outline of final report		XX						
Method presentations		XX						
Week 2 Meeting w/ Liaison		XX						
Conduct Interviews			XX	XX				
Gather and Analyze Data			XX	XX	XX			
Draft of methodology		XX	XX					
Week3 Meeting w/ Liaison			XX					
Prelim. data presentations			XX					
2nd draft of lit review				XX				
Lit. Presentations				XX				
Week4 Meeting w/ Liaison				XX				
Contents, tables, Appendix A					XX			
Data present./ analysis drafts					XX			
2nd draft, Intro/Methodology					XX			
Week5 Meeting w/ Liaison					XX			
2nd draft of data analysis						XX		
2nd draft conclusions						XX		
Week6 Meeting w/ Liaison						XX		
Draft proposals due							XX	
Dress rehearsals							XX	
Week7 Meeting w/ Liaison							XX	
Final presentations/report								XX