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The Establishment of a School and Community Museum

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THE ESTABLISHMENT OF A SCHOOL AND COMMUNITY MUSEUM

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By

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ABSTRACT

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This study was made in order to determine the practicability of establishing school and community museums in the State of Kansas.

Many of the state, private, and W. P. A. museums were visited in order to learn the best museum practices and procedures.

According to the best authorities every small school and community museum should have four divisions of exhibits, history, art, science, and industrial materials.

The methods of collecting, preparing, preserving, and exhibiting history, art, science, and industrial materials were outlined.

The classifying, labelling, cataloguing, and arranging of exhibits according to the recognized standard procedure are presented.

School and community museums with their educational values may be had without prohibitive cost by any community.

INTRODUCTION

A movement which has much cultural and educational significance for Kansas is that which is resulting in the establishment of community museums. The community museum idea began in Europe a few decades ago. The movement spread to our country when the Federal Government, in its search for some ideas that might provide labor and yet develop culture, sponsored the idea of museum building as a W. P. A. project. As a result, twenty-seven projects have been started in various cities of Kansas since 1936. Thus began the movement which should be a great stimulus to museum development in many other communities with a corresponding increase in the total educational and cultural facilities of our state.

Although rich in both natural and artificial specimens and artifacts, Kansas has only a few museums, and only a meager portion of the state's population has ready access to them. Museums have a great educational value to the citizens of a community and are highly useful in supplementing the work of the community school system. It is to be hoped that the movement which has been fostered by the W. P. A. will result in the establishment of museums in all parts of the state. For this reason and for the reason that museums are valuable educationally, the writer is preparing this manuscript on the problem of building a community and school

museum.

In making this study, many civic, school, and community museums were visited including the William Rockhill Nelson Gallery of Art and the Atkins Museum of Kansas City, Missouri, the Museum of the Kansas State Historical Society at Topeka, Kansas, and the Emporia, Kansas, High School Museum. These were visited primarily for the purpose of studying the problems of museums in art and history. The Denver City Museum at Denver, Colorado, the United States Government Museum at the Petrified Forest in Arizona, the Science Museum of the Kansas State Teachers College of Emporia, Kansas, and the Independence High School Museum at Independence, Kansas, were visited to study museum problems regarding natural science. The University of Kansas Museum at Lawrence, Kansas, the Museum of the Kansas State Teachers College at Pittsburg, Kansas, and the Crawford County Community Museum at Girard, Kansas, were visited for the purpose of making a special study of museums which emphasize history, art, science, and industry.

Many museum authorities were consulted for suggestions in the study of museum problems. Much credit should be given to Mrs. Harrison Parkman, State Director of the Women's Progressive Division of the Works Progress Division of Kansas, Mr. H. L. Sticher, Director of Traveling Exhibits, Mrs. Barley, Regional Director of the Museum Work at Chanute,

Kansas, Mrs. Lena Martin Smith, Director of the Crawford County Museum Project at Girard, Kansas, Mr. Kirk Ramey, Principal of the Emporia, Kansas, Junior High School, and Dr. H. H. Hall, Director of the Museum at the Kansas State Teachers College at Pittsburg, Kansas.

A large number of references were consulted for suggestions on building a museum. Among the reference materials were bulletins and pamphlets from the American Museum of Natural History at New York City, the United States Museum at Washington, D. C., and the Museum Division of the W. P. A. of Kansas. The proceedings of the American Association of Museums constituted a valuable source of information for all phases of the museum problem. Many of the ideas concerning educational values and educational practices of museums were gained from reading the discussions in these journals.

The writer found many books which were helpful in studying the problems of museums. The Manual of Small Museums by Laurence Vail Coleman, Antiques, Their Restoration and Preservation by A. Lucas, Nature Chats by John Harvey Furbay, Handbook of Paleontology by Winifred Goldring, Lessons in Taxidermy by J. W. Elwood, and The Educational Values of Museums by Louise Conolly furnished much valuable information.

The actual work of establishing a museum in Cherryvale was begun in 1938. For several years previous to this time

the writer had collected at odd times science materials, such as mineral specimens, fossils, and natural science specimens. In August, 1938, a loan of history, art, and industrial materials was obtained from the Museum Extension Project of the Kansas W. P. A. This material, supplemented by the science materials mentioned above, forms the nucleus of a collection from which it is intended to develop the community and school museum.

Much of the science material was collected by pupils under the supervision of the instructor in biology. During the coming year the writer plans to increase this collection by class excursions and field trips. It is hoped that a room devoted solely to the museum may be obtained during the coming year. The W. P. A. collection and the science collection may then be placed together. The future of this small embryonic museum may seem vague and doubtful at this time, but sincere efforts will be made to develop it into a useful school and community institution.

CHAPTER I

AIMS OF A COMMUNITY MUSEUM

The function of a community museum is distinctly educational. Coleman (1927) states:

> Most museums render public service--whether indirectly through research or directly through education. The latter seems to be the more fruitful line of effort for a small museum and energies which are put forth in such work are well spent. In fact it has been asserted that museums are able to give more hour for hour than any of the great universities. . . . The ultimate purpose of museums is to raise the general level of refinement by giving pleasure and imparting knowledge.

If the purpose of the museum is accepted as being educational, what then are its specific educational values? The educational values to be derived from museum learning are found in answering questions concerning the predecessors of present day man and in translating today's progress into terms of future advancement. Who were his predecessors? Where and how did they live? What were their ideas of government and social relationship? What were their ideas of art and culture? What living things preceded them in their environment? What was and is the nature of the inorganic factors of their environment? What inventions and discoveries did they make? All these questions are pertinent to men and as they are answered, one may see the hand of progress pointing out the direction of future advancement.

It is in answering these questions by visual evidence that the museum fulfils its special educational values.

The museum answers these questions for all ages and all classes of citizens. The school children or the adults have before their eyes in the museum objective knowledge that not only can be interpreted in terms of past experience, but leads to the formation of new ideas that may be utilized as learning in any field of subject matter in education.

If one accepts the museum as an educational agency with specific educational values, it may be assumed that its functions may be coordinated with those of the school. The educational significance of museum materials has long been recognized in communities where museums are in existence. At the present time many large museums devote some time each day for the instruction of groups of school pupils. The trend of thought today in museum literature seems to be toward making a fuller and more complete cooperation between the museum and the school (Coleman, 1927). Therefore it is apparent that there is a need for the statement of a museum's educational values in terms of school objectives or aims.

The following are pertinent school aims that may be fulfilled or supplemented by museum learning: Development of a knowledge of the customs and history of the community; development of a knowledge of one's own environment through the study of scientific exhibits; development of an appreciation

of the art, scenic, and historic objects of the community; development of a knowledge of the community's industries and natural resources; development of the individual's power of observation through the collection, classification, and observation of materials taken from his surroundings.

The development of a knowledge of the customs and history of the community is one of the objectives for study in the field of social science. The museum will afford an opportunity for vitalizing the learning in history, language, and geography. It may be timely to state that these subjects are among those which frequently fail to stimulate the learner because of a lack of illustrative teaching materials.

The development of a knowledge of the individual's environment, which is one of the aims in the study of natural science, may be aided by the museum display of natural science objects. Botany, biology, agriculture, general science, nature study, geology, and chemistry are subjects which will benefit greatly by the supplementary materials in the science section of a museum.

Appreciation of the art, science, and historic objects of the community or region is one purpose of the study of art. Art museums provide a stimulative effect upon the pupil's learning which cannot be obtained in any other way.

The development of knowledge of the industries and natural resources of a community may be greatly augmented by the

display of materials which are frequently inaccessible to school classes. Physics, chemistry, general science, commercial geography, and manual arts are some of the subjects which may use the industrial exhibits as a means of enriching the subject matter content.

The development of the power of observation may be promoted by having the pupil aid in the collecting, classifying, and observing the materials which are collected for the museum. The collecting and classification of science materials, or the making and collecting of industrial materials, may provide the pupils with experiences which will tend to train them in perceiving things in the world about them.

The museum is capable of making positive and supplementary contributions to the values derived from community education. The museum may provide materials and methods for making the community educational processes more real and meaningful. The museum will provide an artistic and intellectual stimulation for the school and community. Since all these things are necessary for good community education, the writer feels that the aims and values outlined above show the true purpose of the school and community museum.

CHAPTER II

GENERAL DISCUSSION

The problem of how to establish a community and school museum may be divided into four major questions: What fields of human endeavor school be encompassed by the museum? How, where, and what materials may be obtained for the museum? Where and how will the museum obtain a building? and How will the curator be selected?

A community museum should include the four fields of human interest, namely: History, Science, Art, and Industry. How these four fields are further divided will depend largely upon the educational needs of the community and upon the accessibility of materials for building the museum.

The writer shall discuss only the needs of communities where there is no existing museum of any sort, and where the materials which may be obtained for exhibition are similar to those of most other communities.

How the museum will meet the needs of its community depends upon how well it fulfils the school aims mentioned previously. The realization of an educational need and the setting up of the aims for satisfying the need are only the beginnings. Unless there are materials in the museum collection that stimulate the learner's curiosity and cause him to learn and satisfy his curiosity, there will be no fulfillment

of aims. Therefore, there must be in the museum collection, materials from the four fields of human interest which will cause learning to proceed in the direction of the aims.

The development of a knowledge of the customs and history of the community requires that the museum have a section set aside for the exhibition of historical materials. All communities have a great many articles that are valuable historically. It will be one of the duties of the curator to search for these articles. This should be done either by personal visits or by a general invitation by means of the local newspaper to people to contribute articles to the museum. Many people hesitate to offer articles they possess until they have visited the museum and have seen some of the articles exhibited. Hence it is important to urge visitors to attend the museum.

Articles which have a historical value and will often be found in a community are: old books, newspapers, flags, pictures, letters, furniture, kitchenware, clothes, tools, coins, Indian relics, and all articles which have passed out of common use and existence.

The development of a knowledge of one's own environment through the study of scientific exhibits makes it necessary to have scientific materials such as zoological, botanical, geological, mineral, and paleontological specimens. These materials may be collected on field trips or exploring trips

to different parts of the community. Frequently some one in the community will have scientific specimens to donate.

In order to develop an appreciation of art and of the scenic and historic objects of Kansas, there must be a section of the museum devoted to the arts. Art materials, such as paintings, old laces and linens, pottery, old glassware, tapestry, silverware, jewelry, and furniture will often be contributed by the people of the community.

There must be a section of the museum devoted to the purpose of developing a knowledge of the industries and natural resources of the state. Materials for this section, such as pictures, and samples, may often be obtained from the industrial establishments themselves, while models of industrial machinery and equipment may be made by high school science or manual arts classes.

A development of the pupil's power of observation will depend greatly upon the presentation of a large variety of objects of historical, scientific, art, and industrial nature and upon the correct classification and orderly arrangement of these materials. Therefore, it is necessary that much material be assembled and that strict attention be given to the labelling, classifying, and arranging of materials.

Articles contributed should be promptly marked with the name of the donor and all information which makes the article important. Materials found on field trips should be promptly

tagged with data showing where the material was found.

It is important that zoological and botanical specimens be classified and preserved as quickly as possible after collection. The classification should consist of the scientific name and the English name. Insects should be killed and mounted on pins. Other animals should be mounted or embalmed, or in the case of small animals, the specimen may be placed in a preserving fluid. Plants should be dried and placed in plant presses.

The work of collecting scientific materials should be done as much as possible under the direction of the curator of the museum in order to prevent unwarranted destruction of plant and animal life. Young children and high school students usually are not competent to do the collecting alone. The biology instructor or Boy Scout leader in the community may be interested in supervising the collecting of animal and plant specimens in case the curator is unable to do so.

The problem of obtaining a building or housing for the museum is one that will require careful consideration. Many museums have originated as a hobby in a home, in a schoolroom, or in a public library.

Unless the community museum project is fortunate enough to have a large group of public spirited citizens back of it, there will be small chance to open the museum in a building especially designed and built for its purpose. However,

there is no reason why a person, or persons interested in starting a museum, may not get permission to use any available and suitable space in a public or private building to house the museum. Most school administrators will be enthusiastic about the project and will be interested in giving space in the school building if it is available. Many schools already have a small museum and would be glad to turn over the responsibility for maintaining it to some one qualified to direct its growth. The chief difficulties to be encountered in locating the museum within the school building would be: first, that of a probable limitation of space; second, that of too close incorporation of the museum into the school curricula.

Very few school systems have enough vacant room that a museum could be afforded a large space sufficient for its unstunted growth. A museum located within the school would probably come to be looked upon as an integral part of the school. A museum, to fulfill its highest purposes of education and culture, must be apart from any influences of school curriculum. To be a real educational and cultural influence for the community it must be as distinctly separate as the public library and yet, must be ever willing to cooperate and coordinate its work with the school as does the public library.

A good location for a community museum must be near the

school and yet it must not be so near that its management falls within the sphere of the administration of the schools. An old house located near the school grounds might make a good building for housing the museum in its earliest years. If the growth of the museum contributes the values it should to the community, there should not be much difficulty in getting community support or, perhaps, the partial support of the city and board of education, or other civic authorities in securing larger quarters.

The third problem in building a community museum is that of obtaining a curator or supervisor. This is the most important problem and the one hardest to solve. The success or failure of a museum in its earliest years depends much upon the industry and personality of the curator. Therefore it is important that a community secure a curator with enthusiasm and with a vision of the work to be done.

Many communities may feel unable to furnish a salary adequate to secure a full time curator. A curator of ability might be secured by offering part time employment as curator and part time employment in some other vocation, such as teaching, or a librarian. This arrangement must depend upon a long time contract, or agreement, between the curator and the parties employing him, in order that the curator shall have an opportunity to carry out his plans for developing the museum.

CHAPTER III

COLLECTING, PRESERVING, AND PREPARING MATERIALS

Collecting, Restoration, and Preservation of Historical and Art Materials

The matter of collecting and preparing articles for the museum demands first consideration. Since the fields of history, science, art, and industry are to be represented in the museum, each field will be discussed and methods of collecting and preparing materials pertaining to each will be given.

The methods of collecting materials to use in building historical exhibits are chiefly those of advertising and searching. Much material may be secured by advertising in the local paper or by publicizing the work of the museum through write-ups of visits to the museum by people of the community and others. There is a certain pride of ownership among people who possess historical objects. The desire to have people see and in a sense worship that ownership causes people to desire public display of the historical objects they possess. If the people of the community can be induced to visit the museum, there will follow many offerings of things valuable historically.

Students and friends may be enlisted in searching through the attics and storehouses of the community for

discarded articles that may be valuable in the exhibit. Interviews with older inhabitants and searching through files and records may give clues to articles. Old books may be found in second hand book stores or book catalogues. Stamps may be got through catalogues. Old furniture, pictures, firearms, kitchenware, tools, and clothes may often be found in second hand stores. Every second hand store in the community should be thoroughly inspected in the search for museum articles.

Museum materials may often be obtained from people of the community who have relatives and friends in other states or even in distant lands. These relatives and friends often send curios and other materials which may have a slight intrinsic value, but may be something suitable and worth while to add to the historical collection.

Materials may be obtained by a tax supported institution from the Works Progress Administration Museum Extension Project in Kansas. Whenever it is desired to secure a loan of historical materials from this source, the curator must sign a contract which stipulates that the signer is acting for a tax supported institution, that all expense incurred in transportation will be paid by the borrower, and that the materials will be used solely for educational purposes.

Only a limited amount of this material may be loaned to any one institution. Among the materials that may be secured

are: historical dioramas, panoramic illusions of historical events depicting John Brown's activities, a wagon train on the Santa Fe Trail, Coronado's journey, and many other events. Dioramas were first popularized at the Chicago World's Fair in 1933. Figurines depicting American customs of the past three hundred years and figurines showing customs in foreign lands may also be secured. Other historical materials are models of ships, stage coaches, looms, printing presses, early American furniture, and Indian clothing.

Historical materials may be classified under the following six types of materials: language, work, war , commemorative, models, and Indian artifacts. The language materials are articles such as letters, newspapers, books, autographs, and legal documents. The work materials are represented by kitchen utensils, tools, furniture, and clothes. The war materials are flags, uniforms, firearms, and other military equipment. The commemorative materials are articles such as stamps, pictures, and coins. Models are the materials such as dioramas, figurines, ships, stage coaches, looms, printing presses, and early American furniture. Indian artifacts are materials such as arrow heads, spear heads, stone axes, bows and arrows, clothing, and pottery.

In general the success of obtaining a collection of historical materials for the museum will depend upon the enthusiasm and aggressiveness of the curator and the degree to which

he can enthuse and stimulate his helpers to the task.

An item of great importance in the collecting of historical materials is that of securing and recording data. The difference between a relic and rubbish is frequently a matter of identification. One definition that has been given for a relic is that it is an object which has something about it which teaches. It must recall in some measure the conditions of the vanished period. If objects being collected are not promptly tagged with the proper information, there is great danger that either misinformation or no information at all will be given, and what might have been a valuable article historically becomes mere museum rubbish. The rule of collecting should be to label promptly each article with the correct data of historical significance and ownership.

The collecting of materials for use in building the art section of the museum involves much the same methods as in collecting historical materials. The art exhibit must gain publicity through the reputable agencies of the community. The community must be urged to come and see. The museum should keep a record of all people who visit it. The curator should arrange to have a column in the daily or weekly paper and enter in this column the names of those visiting and the names of those donating or loaning articles. Such publicity is bound to be reflected in inquiries about the need for and

suitability of art objects possessed by people who have seen or heard of the museum's collection.

Many small collections of art objects are often found in one's own home community. Inquiry about such exhibits frequently results in an invitation to see the collection. The curator may gain ideas from these visits about where to collect certain art objects or perhaps may be able to exchange superfluous materials he possesses for something different and useful. Occasionally the home collector has tired of his hobby or perhaps it has grown so large as to prove a burden and he may be quite willing to loan or donate part or all of his collection to the museum. Many museums have started as the result of someone's overgrown collecting hobby.

Art objects may be discovered by seraching through the same places in which historical materials may be found. Second hand stores, attics, cellars, old stores, and old houses may contain worth-while articles. Valuable art objects have often been recovered from old rubbish heaps.

Some art materials that may be found in any community are glassware, pottery, pewter, copper, brass, iron and silver metal work, paintings, prints and etchings, quilts, samplers, laces and articles of clothing, jewelry, and furniture.

The Works Progress Administration Museum Extension Project in Kansas also loans art materials to tax supported institutions which fulfill the requirements as stated in

connection with the collection of historical materials. Some of the art materials that may be secured in this way are: pottery, textile weaving, basketry, metal work, leather work, horn carving, wood carving, marionettes, native Indian handiwork and block prints of textile designs, Kansas landmarks, native flowers, and native birds.

Art materials, for the purpose of collecting, may be classified as Personal Adornment, Home Adornment, Fancy Work, and Utility Arts. The following grouping of art materials has been made for each class: Personal Adornment, jewelry and clothes; Home Adornment--paintings, primitive paintings, prints, block prints, and etchings; Fancy Work--quilts, samplers, laces, and linens; Utility Arts--metal work, leather work, pottery, glassware, wood carving, and basketry.

When art materials are collected, just as in the case of historical materials, all information about each object should be recorded. All data necessary to identify the object should be written on a tag and securely fastened to the object.

The work of restoring and preserving Historical and Art Materials is divided into two parts, namely, the methods and the application of methods.

Scientific principles are followed which are largely chemical methods. The guiding principles are to find of what material the object to be treated is composed, and to

ascertain any changes that may have taken place. It is necessary, however, to have a knowledge of the properties of the material so that a cleansing agent will not be used which is harmful to the object, and that proper treatment will be given to restore the object as nearly as possible to its original condition and to prevent further deterioration.

Many large museums maintain a staff of skilled workers with a consulting chemist in charge to assure the proper preparation of museum materials. In small museum work the preparation of materials or supervision of the preparation will be one of the duties of the curator. Since the curator of a small museum may not have had the necessary training in chemistry to undertake the restoration of Historical and Art materials, the following principles of restoration, given by Lucas (1924), are included:

> The first step in restoration is cleaning and the first thing to be done is to remove superficial dust and dirt. This may usually be effected by the use of a small pair of bellows or a camel-hair or similar small soft brush. A duster never should be employed partly because what is happening underneath cannot be seen and followed and partly because a duster is at best a clumsy instrument and may cause damage by catching in corners or in delicate portions of a carving or in loose pieces of inlay, gilt, or paint.
>
> After blowing or brushing off the loose dust, any more adherent dirt may generally be removed by means of water, petroleum spirit, or alcohol. The simplest reagent namely, water should be tried first unless it is manifestly unsuitable.
>
> The nature of the object determines whether water

should be employed sparingly or plentifully. In the former case it should be applied by means of a small peice of sponge or a small camel-hair or other similar soft brush, and for small pieces of inlay and for corners by means of a tuft of cotton wool on the end of a small piece of wood such as a match with the head removed or a wooden toothpick. Each time the sponge, brush, or cotton wool is removed from the object it should be rinsed in clean water before being used again. The water should be frequently renewed. When water is applied in quantity the object should be immersed and well soaked. In all cases warm water is better than cold.

When washing it should be remembered that to wash a large number of times with a small quantity of water each time gives better and quicker results than to wash a few times with a large quantity of water. The rule therefore for all washing is to wash frequently with a little water rather than to wash a few times with a large amount of water.

Before using water it must be certain that it will not have any injurious effects. If one is in doubt on this point he should try water on an inconspicuous portion of the object or on another object of similar kind. Lucas (1924) gives a few general rules concerning the use of water:

1. Articles of faience, glass and pottery, and in some instances stone, may all be washed safely, and generally need prolonged soaking in repeated changes of water. Faience, pottery and stone, however, all of which are very porous and are liable to contain salt, should never be wetted unless they can be thoroughly soaked, otherwise when the object dries again, the salt will be brought to the surface where it will crystallize and cause damage.

2. Articles of wood should not be wetted unless the wood is hard and in good condition, in which case they may be cleaned with a damp sponge.

3. A painted surface should never be wetted unless

it is varnished or has been protected by special treatment. A painted and varnished object will generally bear sponging.

4. Ivory, if in good condition, may be cleaned with a damp sponge or damp brush or even soaked in water, but as a rule soaking should be avoided, as old ivory is very liable to split when wet. Ivory in poor condition should not be wetted.

5. Metals may generally be washed but should always be thoroughly dried afterwards. In the case of silver, copper and bronze that are corroded, washing is sometimes a useful preliminary to further treatment and is always necessary after treatment.

6. Gesso and plaster, unless gilt or varnished should never be wetted.

7. Textile fabrics should not be wetted unless they are in good condition, in which case they may be soaked, if it is necessary to clean them or to remove salt.

8. Papyrus and paper will both stand a limited amount of soaking, but special precautions are necessary in handling them while wet.

9. Parchment and Vellum should never be wetted.

Use of Kerosene and Alcohol for Cleaning.--If the nature of the material is such that water cannot be used, or if water will not cleanse the material, kerosene may be tried. Kerosene should be applied with a camel-hair or similar soft brush. It is useful for cleaning varnished or unvarnished surfaces. Painted surfaces may also be cleaned with kerosene unless the paint contains oil. Kerosene is not suitable for use on oil paint. The nature of the paint on an object should be determined before an attempt is made to cleanse the object.

Alcohol may be substituted for kerosene on painted, unvarnished surfaces, but alcohol must never be used on varnishes. Alcohol may be used with safety on both varnished oil-paint and on waxed surfaces. When using either kerosene or alcohol the brush should be well rinsed in the liquid each time after having been used on the object and the liquid should be renewed frequently.

If water, kerosene, and alcohol prove ineffective in cleansing the materials, special treatment is necessary. The treatment to be used will depend upon the kind of material and the nature of the soiling or corrosion. Lucas (1924) gives a few rules to be followed in the cleaning of such objects:

> 1. Acids and alkalies should never be employed indiscriminately for the removal of deposits, incrustations and discolorations that resist the ordinary solvents and never without a certain knowledge that they will not injuriously affect the object treated and when employed, it should only be in the form of dilute solutions, every trace of which must afterwards be removed by thorough washing.
>
> 2. Attempts should not be made to scrape or chip off hard deposits or incrustations with a penknife or other instrument though this is often done. Thus chloride of silver is often chipped off silver objects and carbonate and sulphate of lime from ivory, pottery or stone. Chipping, however, except in the cases of copper, bronze and iron, is never satisfactory; and the object will almost certainly be disfigured by scratches or even more serious damage will often result. The methods of treating various incrustations will be described when dealing with the materials on which they occur.

3. Deposits and stains of an organic nature (grease, oil, tar) require organic solvents to remove them, and if petroleum spirit or alcohol are not effectual, such solvents as acetone, benzol or pyridine should be tried.

An important rule to be observed in the cleaning of objects is that of taking plenty of time. Hurrying the process of cleaning often involves the risk of using a cleansing agent without knowing definitely whether it may damage the object to be cleaned.

The next procedure in restoration after cleaning is repairing. By repairing or mending is meant the refixing of loose or broken pieces and not the addition of new material. The curator of a small museum may not be trained in repair work and may not have the highest degree of manipulative skill, but with patience, care, and experience he can become sufficiently expert to do most of the simple repairing needed in the museum.

The following rules given by Lucas (1924) will aid the curator in carrying out the repair work of the museum:

1. Always clean an object before repairing it.

2. Completely remove old cementing material before adding fresh. This should never scraped off when dry, but must be softened at first. Glue may be softened by means of warm water, beeswax with chloroform, resin with alcohol, and parafin wax with kerosene or by heat. The solvent used should be applied with a small brush and the softened cement wiped off with a rag or removed by means of a piece of wood or bone, such as a small paper-knife.

3. Only the best quality cementing material should be employed.

4. Patent or secret preparations of cementing material should not be used unless their general nature is known and unless their value has been well proved.

5. The manner in which the various pieces of a broken object fit together should be ascertained by careful inspection and arrangement, but, as a rule and especially if the material is fragile or easily broken, the pieces should not be put actually touching one another before applying the cement, or the edges may break further.

Adhesives, being essential to repairing, may now be considered. They are of many different kinds, but the only ones that need to be mentioned in this connection are glue, casein adhesive, celluloid cement, and plaster of Paris.

Glue.--Glue is an impure gelatin generally extracted from animal bones, skins, cartilage, or tendons, but also from fish. It is one of the oldest, best known, and most reliable of all adhesives, especially for wood.

Only the best quality glue and of as light a color and as free from smell as possible should be employed. Glue, like every other soluble material, dissolves more quickly the finer the state of division, and therefore should be broken into small pieces before use. This is best done by wrapping it in several folds of cloth and breaking it with a hammer. The broken pieces should then be placed in the glue-pot, just covered with water, and allowed to soak for several hours. The pot should then be placed in water which is

boiled until the glue is thoroughly hot and liquid. An ordinary pottery jam-jar makes an excellent glue-pot but should be provided with a cover in order to diminish evaporation and prevent the glue from thickening.

For general use the glue should be fairly thin, about the consistency of golden syrup, but not too thin or watery, and it should be used hot. Thick or tepid glue should never be employed.

Glue is best applied by means of a brush or stick. Two forms of sticks will be found useful, one flat and the other round and pointed. These should be in several sizes. The brush or stick should never be left in the glue after use, but should be removed and washed in hot water. To mend a broken object the glue is evenly distributed as a thin film on both surfaces which if possible should be warmed first, and these are then pressed tightly together and clamped or tied with a string until the glue has set. This will take at least several hours. The greater part of any glue that oozes out is wiped off at once with a rag, but no attempt should be made to clean the surface thoroughly until the joint has set, when any glue remaining may be removed with hot water and a soft rag. To prevent the clamps from marking the object, the surface should be protected by thin pieces of board or pasteboard. When string is used, pads of folded paper should be placed under the string at the edges.

A wooden peg inserted in the string and twisted in the manner of a torniquet will be found useful for tightening. For some purposes spring type clothes pins make useful clamps.

Casein Adhesive.--Casein is the protein from milk, and for the preparation of an adhesive, this protein is precipitated by acids, then washed, dried, ground, and mixed with small proportions of other materials, such as carbonate of soda, flouride of sodium, and slaked lime.

Casein adhesive is frequently called "cold water glue," and is sold in the form of a fine powder which only requires mixing with cold water to be ready for use. It is about equal to the best glue in adhesive properties.

Celluloid Cement.--Celluloid cement consists of celluloid dissolved in an appropriate solvent. A satisfactory cement may be prepared by dissolving celluloid in amyl acetate, in acetone, or in a mixture of the two. The celluloid is rasped or cut into small fragments and put into a bottle, which is then nearly filled with the solvent chosen, repeatedly shaken, and finally left over night. Sufficient celluloid should be used to make a syrupy solution.

For general use a little of the solution is poured into a small dish or saucer, left exposed preferably in a warm place until a sufficient quantity of the solvent has evaporated to produce the right consistency for use. Celluloid

cement is waterproof and is admirably adapted for repairing glass, inlay, pottery, and small stone objects. It may also be used for wood and most other materials, including metals. It is best applied with a small camel hair brush or a small piece of pointed wood. Since it does not set very quickly sufficient time must be allowed for complete setting before the object is disturbed.

When using the cement on a porous object such as pottery, it should be allowed to soak in well before making the joint, or the broken surface should be coated repeatedly with the celluloid solution. For slightly porous or non-porous materials like glass or metal the two surfaces should be coated with the cement, then fitted together, and any surplus cement wiped off. The pieces are then pulled apart and allowed to dry. A second coat of the cement is then applied and the joint made again. When dry the excess cement is removed with a soft rag or a soft brush dipped in amyl acetate or in acetone. As it is rarely possible to clamp articles of glass and pottery while the cement sets in the manner for wood, other methods of keeping the broken surface together must be employed. Occasionally string or thread may be used, but as a rule the best way is to keep the joint in such a position that the weight of the material itself presses the edges together. This may be done by standing the object in sand, plasticine, or adhesive wax. When sand is used, it

should be clean fine quartz sand, free from stone and dust, and should be sifted and washed before use.

Plaster of Paris.--Plaster of Paris is employed for repairing large pottery and stone objects. Only the best quality should be used.

To mix plaster, take as much water in a basin as will give the required quantity of plaster and scatter or shake rapidly and uniformly the powder until all the water appears to be absorbed and no free water remains on the surface. Stir or beat the mixture with a spoon until smooth and use immediately.

Life and durability may be added to plaster of Paris when dry with a dilute solution of celluloid or of cellulose acetate. This gives a slightly polished appearance to the surface. The plaster may be cleaned with a damp sponge without damage. Plaster of Paris may also be given a good surface by impregnating it, when thoroughly dry, with very hot paraffine wax or stearine. The surface is then polished with French chalk and a pad of cotton wool. Stearine gives the plaster a color of old ivory. Plaster of Paris is slightly soluble in water and should not be used to repair objects that require washing.

For the strengthening of articles which are often brought to the museum in a delicate condition, a liquid must be used which will harden and consolidate the fragile material.

Paraffin is one of the most valuable substances for this purpose since it melts easily and hardens at ordinary temperature. Celluloid and cellulose acetate solutions are other valuable substances that may be used for strengthening.

Any material that is to be treated with hot paraffin should be warmed so that the temperature change, when the hot paraffin is applied, will not be so great as to cause a sudden congealing of the paraffin on the surface. The object is to get paraffin to penetrate deeply into the material, and if both the paraffin and the object to be treated are warm the penetration will be much more satisfactory.

Small objects may be immersed in hot paraffin. It may be applied to larger objects by means of a glass pipette. The pipette should be placed quite close to the surface of the object and the wax which must be very hot should be permitted to run out as quickly as possible. Paraffin treatment may be used for beadwork, bone, horn, ivory, and wood.

Celluloid solutions are either sprayed on the object or applied with a small camel hair brush. They are used for bone, ivory, painted surfaces, and textile fabrics. A useful form of spray is an atomizer such as is used for spraying the throat.

The addition of new materials may be necessary if part of an object seems to be beyond repair and especially if the addition will help to hold and thus save the whole piece.

Some special methods in treatment of museum materials for restoration and preservation will be given in Chapter VI, which deals with the care and management of the museum. The following are the physical and chemical tests used by Lucas (1924) to determine the nature of the materials. The physical tests are:

1. "Use of a lens to determine details of color, structure and composition. Compare unknown materials with known materials by use of the lens."

2. Hardness of material--Table of hardness from Lucas:

1. Steatite
2. Gypsum
2.5 Amber, Galena
3. Alabaster
3.5 Malachite
4. Serpentine
5.5 Glass, Lapis lazuli
6. Feldspar, Haematite, Turquoise
7. Agate, Amethyst, Carnelian, Chalcedony
7.5 Aquamarine, Beryl, Emerald
8. Topaz
9. Sapphire
10. Diamond

Minerals that have a hardness of not over 2.5 may be scratched with the thumbnail, and from 2.5 to 5.5 a penknife will suffice for the scratching. The minerals with a hardness of 6 will just scratch window glass while those above this point will scratch glass easily.

3. Fracture--Fractures may be conchoidal (curved, either convex or concave). Amber, flint, glass, obsidian, quartz are minerals that fracture in this way. Even fractures are

those when the surface is flat or nearly so. An example is the fracturing of chert. Earthy fractures are those such as produced in fracture of chalk.

4. Specific Gravity--The specific gravity may be computed, if the object is regular in shape, by determining volume and weight, then calculating the weight of one cubic centimeter of the material which multiplied by 1, the specific gravity of water, gives the specific gravity of the object.

If the object is irregular and its volume cannot be computed by measurement, the volume may be found by suspending the object in a graduated cylinder of water and noting the number of cubic centimeters of water displaced. The volume of water displaced equals the volume of the object, hence the calculation of its specific gravity may be carried out as that given for the regular object.

Lucas gives the following table of specific gravity:

Specific Gravity	Material
1.1	Amber
2.3	Gypsum
2.4-2.5	Lapis lazuli
2.5-2.6	Obsidian, serpentine
2.5-3	Glass
2.6	Agate, amethyst, carnelian, chalcedony, jasper, quartz, rock crystal
2.6-2.8	Feldspar, turquoise
2.7	Alabaster (calute), beryl, emerald
2.7-2.8	Steatite

2.9	Aragonite
3.5	Topaz
3.5-4	Malachite
5.	Haematite
7.5	Galena

The chemical tests are:

1. Solubility--A small quantity of material should be finely powdered and its solubility tested in small quantities of distilled water, alcohol, or gasoline. Some substances that are soluble in water are carbonate of soda, nitrate of soda, sulphate of soda, nitrate of potassium, sodium chloride, glue, and gum. Clay will disintegrate in water and always feels soapy. Some substances which are soluble in alcohol are resin, resin varnish, and wood pitch. A few substances that are soluble in gasoline are bitumen, fat, grease, mineral pitch, and oils.

2. Behavior on heating--Take some of the material on the point of a penknife and heat in a flame. Note whether the material melts, whether it burns, the smell produced, and the nature of the residue if any.

Fat, resin or wax (beeswax) usually melt before they burn. Smear the heated material on white paper. If it leaves a grease stain it is either fat or wax.

Materials which burn are usually organic in nature. Hair, horn and all nitrogenous gases may be identified by their smell.

3. Reaction with Acid--Take a few scrapings of the mate-

rial, powder finely, put in a test tube, and add a little dilute hydrochloric acid. Large objects may be tested by applying a drop of the acid in an inconspicuous place. Watch the action of the acid with a lens. Alabaster (calcite), carbonate of lime, chalk, limestone, and malachite form a green solution. Marble will effervesce when brought in contact with hydrochloric acid. Gypsum dissolves in hydrochloric acid without effervescence.

4. Testing of Solutions--Materials dissolved in water should be tested for alkalinity and acidity with litmus, for chloride by addition of silver nitrate, and sulphates by the use of a barium chloride solution. The water used for dissolving substances must be distilled water. Materials which are dissolved in hydrochloric acid may be tested for sulphates by the addition of barrium chloride.

5. Flame Coloration--Put a small piece of the material to be tested in a watch glass and add a few drops of strong hydrochloric acid solution. Dip a small clean platinum loop into the solution. Remove this loop from the solution and hold in the oxydizing flame of a bunsen burner. If a color is imparted to the flame note this and determine the metal present in the material. The following colors are indicative for the metal following: brillant yellow, sodium; light red, calcium; bluish green, copper; and lilac or delicate pink, potassium.

The identifying characteristics of some substances follow:

Beeswax burns with a smoky flame and has a characteristic wax smell.

Calcium Carbonate effervesces with Hcl and gives a light red flame test.

Glue gives a disagreeable nitrogenous smell when it burns.

Gum has no nitrogenous smell on burning but chars on heating.

Malachite dissolves in Hcl with effervescence and gives a green colored solution.

Resin is soluble in alcohol, burns with smoky flame and smells like burning varnish.

Salt may be precipitated with silver nitrate and will impart a yellow color to the bunsen flame.

Gypsum will dissolve in Hcl without effervescence and will impart a light red color to the bunsen flame.

The Collecting and Preparation of Science Materials

The collecting of science materials for the museum presents problems quite different from those in the collecting of historical and art materials. Collecting science materials is largely a matter of field work, although frequently there may be an accession of science objects to the museum which has already been collected and prepared by some individual in the community.

The aim in collecting science materials should be to get as large a representation of each group as possible and to

get a representative or a number of representatives of each phyla and sub-division. A representative of each rock formation and of as many mineral specimens as possible should be secured for the geological material.

Science materials, for the purpose of collecting, may be arranged under four natural groups; botanical, zoological, geological, and paleontological. A discussion of the methods of collecting and preparing botanical specimens for the museum will follow.

Specimens should be collected in dry weather. All parts of the plant flowers, leaves, stem, and root must be obtained, if possible. In the case of very large plants it may not be practical to take more than small portions, since it would probably be impossible to get the whole plant in a preservative or in a plant press. The flowers should be in full bloom, and if staminate and pistillate flowers are on separate plants, a specimen of each should be mounted. Every plant should be represented by mountings of the important stages in its life cycle, the seed, the seedling, the flower, and the fruit.

It was stated previously that a large variety of plant phyla and subdivisions should be collected and mounted. Attention also should be given to collecting plants which best show the different methods of securing cross fertilization, of scattering seeds and fruits, different habits of climbing,

various modes of protection against too rapid transpiration, or against mechanical injuries.

Plants of different habits should be represented, such as those growing in dry places, in moist soil, in wet soil, and in swamps or water. Plants which grow seasonally, spring plants, summer plants, autumn plants should also be represented in the collection. Photographs of plants growing in their natural habitat should accompany the mounted specimens. A map of the community might be made which would show the different habitats of the plants.

It is obvious that a plant collection of this nature, properly mounted and displayed and accompanied with adequate information has a great educational value.

An important duty in connection with the collecting of plants, as in all collecting for the museum, is the recording of data. This should consist of the scientific and English names, the locality where found, the habitat, date of collecting, and the name of the collector.

The equipment for collecting botanical specimens is simple and inexpensive. It consists of a large tin collecting box, a smaller tin collecting box, a trowel or digger, a pocket lens, and a sharp pocket knife. The large collecting box should be about 20 inches long, 10 inches wide, and 5 inches deep. The lid should occupy one entire side of the box, should fit tightly, and be kept securely closed when

plants are in it. The box should be fitted with straps so that the collector may carry it slung over the shoulder or in the hand. The smaller box may be a pocket size tin box with a tight fitting lid. This box is to be used for carrying very small plants. The trowel or digger should be seven or eight inches in length and may be carried in a leather sheath around the waist. The pocket lens may be inexpensive but should have a magnifying power of about five times. It will be useful in helping to identify or determine taxonomic characteristics of plants. The pocket knife will be found useful to cut sections of plants for examination with the lens.

The Preparation of Plant Specimens.--There are two general methods for the preparation of plant specimens for the museum. One method is to place the green plant in a preserving solution and the other method is that of drying and pressing the specimen.

Plants are easier to preserve than are animals but the problem of color retention is one not easily solved. Alcohol and formaldehyde are the solutions most frequently used for plant preservation. Formaldehyde is used more often than alcohol especially for preserving whole specimens. A weak solution of formaldehyde, about four per cent, is used although certain fleshy plants may require a five or six per solution. Green plants fade badly in formaldehyde. Furbay

(1933) recommends the following preserving solution:

90 C.C. 50 per cent alcohol
5 C.C. commercial formaldehyde
2.5 C.C. glycerine
10 grams of copper chloride
1.5 uranium nitrate

Green plants placed in this solution will not fade and may be removed in ten days or two weeks to be pressed or mounted.

It is more difficult to preserve the natural colors of flowers but this may be aided to a certain extent by adding ten per cent of pure sugar to the plain formaldehyde solution.

Fruits may be preserved whole in the following solution:

1 part glycerine
1 part commercial formaldehyde (40 per cent)
2 parts zinc chloride
40 parts distilled water

The zinc chloride is dissolved in hot distilled water and filtered. Then the formaldehyde and glycerine are added. If a sediment appears in the bottom, pour off the clear part above and discard the sediment. This solution will preserve the red and green color of apples and other fruits.

Mushrooms and other fleshy fungi may be preserved in their natural colors if placed in the following solution:

1 part commercial formaldehyde
15 parts, 50 per cent alcohol