THE ARCHER METHOD FOR MOUNTING HERBARIUM SPECIMENS

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Since the publication by W. Andrew Archer[1] in 1950 of an article entitled, "New Plastic Aid in Mounting Herbarium Specimens", there has been an increasing interest in the use of plastic for this purpose. In presenting his formula five years ago, Dr. Archer invited prospective users to further improve it and to modify methods of procedure to suit particular needs. We have been using the Archer Method with some slight modifications at the Gray Herbarium with excellent results for several years. The frequent calls for information concerning our present formula and procedure have prompted me to put these into print for the convenience of those interested.

Original Archer Formula

Toluene—800 cc.
Methanol—200 cc.
Ethel cellulose (Dow Chemical Ethocel[2])
standard 7 cps.—250 grams.
Dow Resin 276 V-2—75 grams.

New York Botanical Garden Modified Formula

Toluene—720 cc.
Methanol—180 cc.
Ethocel—250 grams
Dow Resin—75 grams

Gray Herbarium Modified Formula

Toluene—880 cc.
Methanol—220 cc.
Ethocel, standard 10 cps.—1750 cc. (560–650 grams).
Dow Resin—75 grams

First mix methanol and toluene; then add and dissolve the resin completely. Finally mix in the ethocel adding it gradually. The resulting stiff coarse mixture should be stirred slowly until the ethocel is partly dissolved. There will be many bubbles

[1] Rhodora **52**: 298–299. 1950.

[2] Ethocel and Dow Resin are obtainable from the Dow Chemical Company, Midland, Michigan. At present the Ethocel may not be purchased in less than 50 pound lots at a cost of about $40.00. The Dow Resin is sold in a 5 gallon container. This may seem expensive, but fifty pounds of Ethocel and five gallons of Dow Resin together with appropriate amounts of the solvents have provided the plastic for mounting over 40,000 specimens.

and large particles present at this stage, but the solution will clear in about 24 hours.

It will be quickly noted that the users at both New York and at Gray found the original formula less viscous than desirable. In the New York modification, less solvent is used, and the proportions of Toluene and Methanol are maintained. In working toward greater viscosity, my own procedure was to obtain Ethocel of standard 10 cps. (to replace standard 7 cps.) and to increase the proportion of ethel cellulose. The first combination that came close to meeting with satisfaction was based on the use of 1000 cc. of solvent. However, this proved to be difficult to use in the dispensers; hence, another 100 cc. of the solvent was added to the formula. It should be understood that the formula was arrived at by trial and error, and I feel sure that several different combinations of the basic materials originally put together for this purpose by Archer would be very satisfactory.

In a recent letter, Dr. Archer notes that the Gray Herbarium Formula, using 625 gms. of ethocel, has proven to be too thick for some dispensers. He is now using the following formula: toluene 880 cc.; methanol 220 cc.; ethocel (standard 10 cps.) 575 gms.; resin 75 gms. I feel sure that the use of a weight measure for the ethocel is at the base of the inconsistencies experienced by different persons in making up the formula. For example, the weight of 1750 cc. of one lot of ethocel was 659.7 gms., while the weight of 1750 cc. of another lot was 560.5 gms. It appears that volume measure is more reliable than weight measure. At least, we have always used and gotten consistent results with a volumetric measure in handling the ethocel. It may be necessary to make minor adjustments in the formula with each new lot of ethocel. However, I do not believe the proportions are at all critical and they may be shifted somewhat without materially devaluing the final product.

We find it possible to mount large woody materials, even pine cones, by use of the above formula. The viscosity is such that it will hold well on the sides of a branch or stem and not produce a weak point in the strand by thinning at the vertical part. Our aim is to put the plastic in a strap-like form over the stem or a portion of the leaf etc., in such a way as to have each end

of the plastic strap firmly anchored on the mounting sheet. On large leaves, holes are punched with a paper punch a centimeter or two from the edge at intervals around the leaf. The plastic strap is spread from the mounting paper to the hole through which it reaches the paper beneath the leaf. Thus, a large leaf can be as firmly strapped to the mounting sheet as can stems and other parts of the plant. This procedure essentially eliminates the need or the desirability of smearing the specimen with plastic on the side placed downward on the mounting sheet. The mounting job, then, is essentially one of strapping the specimen to the sheet with plastic straps squirted from a pressure oil can. Occasionally on especially bulky materials or where a specimen will not lie flat, plastic is used beneath the projecting part of the specimen to provide a kind of seat upon the paper. It is important to have a strap stretch from paper at one end to paper at the other. The bonding of the plastic with the specimen itself is often imperfect and cannot be relied upon to hold. This is not true with the plastic to paper bonding which is exceptionally strong.

Some users of plastic as a mounting medium have experienced difficulty from having stacked the sheets before the plastic was fully dry. The sheets stuck together and produced real difficulty. Actually, the plastic dries quite rapidly, and the sheets can usually be safely stacked in about 40 minutes to an hour. Also, some users require a large amount of table space for their mounting operation because the specimens are laid out on the sheets side by side on tables. After a group of specimens are laid out and weights put into position, the mounter applies the plastic. While these are drying, a second group of specimens is laid out, etc. When the first group is dry, the sheets of specimens are then stacked. We have eliminated the need for a large amount of table space and made the time factor in drying unimportant by two simple procedures. Furthermore, the mounter is permitted to sit down while working.

The sheet of mounting paper is placed upon a double-faced corrugated cardboard slightly larger in size than the sheet. The label is affixed to the sheet; the specimen is placed and weighted;[3] and finally the plastic is applied. The mounter

[3] For weights, we have found broken up type-plates to be ideal. These lead sheets

then puts four small wooden blocks or, other objects of similar nature, on the cardboard near the four corners. The cardboard carrying the mounted specimen with the plastic still wet is then stacked. Each successive cardboard in the stack is held above the wet plastic of the sheet below, and the stack may be left until the plastic is dry without inconvenience. The wooden blocks are of two or three lengths so that four blocks as much as an inch long may be selected if the thickness of the specimens requires it. The cardboards are easily obtained from paper box manufacturers. For us, the double-faced corrugates commonly used in plant presses serve very well.

Dispensing the plastic provides no great problem. We find the "pistol grip" pressure oil can of the type used for spraying the springs of automobiles very satisfactory. This type of dispenser, called to my attention by Dr. David D. Keck, can be used continuously for several months without cleaning. At first, we were careful to cover the end of the spout while not in use, thinking the plastic would harden in it. However, this proved to be an unnecessary precaution, for the plastic seals the end of the spout very quickly; and the short plug formed is easily squeezed out even after several days have elapsed. If the plastic hardens in the spout, the nozzle can be soaked in the solvent. The spout of the dispenser is made of brass, and the copper present reacts with the plastic to make the plastic greenish in color. If the dispenser has not been used for several days, the plastic in the spout will be quite colored. For those who find this objectionable, it is a small waste to squeeze that amount away before starting the mounting of specimens. The barrel of the dispenser should not be brass, for the whole of the contents will then become colored. Whenever the dispenser becomes fouled after long usage, it can be cleaned by disassembling it and submerging the parts in the solvent for several days.

Our mounters find it worthwhile to wipe the end of the spout of the dispenser frequently to keep the flow of plastic smooth. This produces a neater strap and prevents unnecessary threading of the plastic itself. In fact, they find it convenient to work

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can be readily broken into many different sizes. Of course, any relatively heavy bits of metal will do very well.

with the dispenser in one hand and a small cloth in the other wiping the nozzle after every few straps extruded.

The plastic once made up appears to have excellent keeping qualities if kept in an airtight container. Once dried after use in mounting, it is tough and durable and not easily broken even by a direct hit with a metal object.[4] There is some contraction of the plastic on drying, and this tends to pull the specimen tight against the paper giving the full value of support to the specimen that the paper can provide. The fact that the plastic does contract makes it inadvisable to use long straps, especially if several are put parallel to one another. Several long parallel straps will contract enough to pull the mounting paper into wrinkles. We use straps mostly below an inch in length although occasional longer ones are required and can be safely used. The first tendency of the mounter in using the plastic is to put long straps over several culms of grass or similar specimens. This should be avoided not only because it tends to form wrinkles in the sheet, but also produces unsightly mounted specimens as well. While the strap should be kept relatively short, its thickness may be increased by passing the stream of plastic back and forth several times.

Some feel it is too early to evaluate completely the Archer Method from the point of view of what may happen to the plastic straps after forty or fifty years in the herbarium. However, if the plastic holds after five years, it seems to me that it might be expected to hold indefinitely. One thing we do know is that the plastic does not appear to become brittle with the passage of time. And there are apparently no *a priori* grounds upon which to predict any appreciable change in the chemical or the physical nature of the plastic straps unless they are subjected to a powerful solvent. The latter seems highly unlikely in a well kept herbarium.

The chief advantage of the Archer Method is the speed-up possible in the mounting. In rough calculations, we have found that a mounter can prepare and mount three or four specimens using this technique in the time required to mount one specimen

[4] Paradichlorobenzene has been reported to soften the plastic even after it has dried thoroughly. Our own tests with a high concentration of p d b at room temperature did not produce any noticeable affect. However, no tests were made under varying conditions of temperature and moisture.

using paste and gummed cloth strips. Where heavy specimens are sewed, the time saved is even greater, for sewing is not required. A second advantage comes from the possibility of repairing specimens in the herbarium itself. A dispenser filled with plastic can be kept handy for remounting loose specimens or broken parts by the botanist while he is actually working in the herbarium. This eliminates the necessity of having the specimen out of the herbarium in the hands of the mounter and of having to refile it in the herbarium at a later time. Personally, I believe the use of plastic makes a better looking mounted specimen. However, all botanists may not agree on this point.—GRAY HERBARIUM OF HARVARD UNIVERSITY.

PINUS RIGIDA MILLER IN QUEBEC.—Owing to the lack of authentic records, the presence of *Pinus rigida* Miller in the province of Quebec had always been in doubt. During a field trip in the region of Saint-Chrysostôme, Chateauguay County, made on September 4th, 1954, Mr. Lionel Cinq-Mars and the author have found a natural stand of *Pinus rigida* at Cairnside. The mixed stand covers an area of about a square mile. The trees growing in the forest attain around thirty-five feet in height and about eight inches in diameter. When they grow on the bare Potsdam sandstones, they are stunted and the lower branches are heavily covered with cones. *Pinus resinosa* Ait. and *Pinus Strobus* L. are also present in the area.—ERNEST ROULEAU, HERBIER MARIE-VICTORIN, UNIVERSITÉ DE MONTRÉAL.

Volume 57, no. 681, including pages 241–268, was issued 4 October, 1955.