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UNIVERSITY of PENNSYLVANIA

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CENCO  
The College  
MOUNTAINSIDE

DEPARTMENT OF PHYSICS

August 12, 1963

Central Scientific Company  
237 Sheffield Street  
Mountainside, New Jersey

Gentlemen:

July 31st, I placed with your office a telephone order for one Hvac-2 vacuum pump, Model 91305, Type 1. On August 5th, the Purchasing Department of this University issued Purchase Order No. 57815 for \$165.00 in confirmation of the initial telephone order. The pump, Serial No. 3012, arrived July 5th and is already in service.

Today, August 12th, we received another new vacuum pump, Model No. 91305, Type 1, Serial No. 4015, and your invoice no. N14456-4 for \$165.00. Evidently, the purchase order confirming the initial telephone order has been misinterpreted as a new order for a second pump.

We are now sending your office a third pump we have on hand, Model No. 91305, Type 1, Serial No. 877, somewhat in need of repair, and would like to accept it as trade-in on the price of the second pump you sent us, and we are holding your invoice No. N14456-4 until we receive your purchase order for that amount remaining due.

Sincerely yours,

Robert Stuckenrath, jr.  
Radiocarbon Laboratory

A DM.

December 18, 1964

Central Scientific Company  
237 Sheffield Street  
Mountainside, New Jersey

Dear Sirs:

Your representative visited us yesterday morning in regard to the matter of payment of a Hyvac pump received here in August 1963.

Subsequent investigation here has revealed that the University of Pennsylvania did pay for the pump.

I have enclosed copies of some of the paperwork. Unfortunately, Mr. Stuckenrath and I did not record the name of your representative who visited us. We shall appreciate it, however, if you will give this information to the proper person.

Sincerely yours,

Elizabeth K. Ralph

EKR:ek

Encls.



**CENTRAL SCIENTIFIC COMPANY**

A DIVISION OF CENCO INSTRUMENTS CORPORATION

April 13, 1965

Dept. of Physics  
Miss Elizabeth K. Ralph,  
University of Pennsylvania,  
Philadelphia, Pa.

Dear Miss Ralph:

We refer back to a letter written by you on December 18th, 1964 in which you enclosed copies of paper work showing that an invoice covering a HYVAC Pump was paid for.

However, our records are still open on our invoice #N14456 and we find that this was a duplicate shipment, or a first shipment made on your order #57845 - another shipment was made on our invoice N15065 which is the one that was paid for.

We respectfully call your attention to the attached copy of letter from Robert Stuckenrath Jr. of the Radiocarbon Laboratory which we believe will clear up this matter. You will note that this extra pump was received by you and that you planned to return a used pump to apply as a credit toward the purchase price of \$165.00 for the second pump. This used pump was never returned to us, according to our records, and therefore that invoice #14456 is still open in its entirety.

It is hoped that this matter can be brought to a conclusion and we believe that with the attached copy of letter this matter can be cleared up.

Very truly yours,

CENTRAL SCIENTIFIC COMPANY div. of  
CENCO INSTRUMENTS CORPORATION

*N. Kartagenev*

NK

Encl: Copy of letter  
Duplicate copy of invoice #N14456

January 30, 1967

Shelby Jones Co., Inc.  
P.O. Box 514  
Havertown, Pennsylvania

Gentlemen:

Under University of Pennsylvania Purchase Order 126508,  
we ordered:

10 R327A valves  
80 4HS150 cylinders  
8 S26 fittings

We have received under this order:

8 R327A valves  
10 4HS150 cylinders  
3 S26 fittings

Can you advise us as to shipment date on the remaining  
items? Thank you.

Sincerely yours,

Robert Stuckenrath, jr.  
Radiocarbon Laboratory

February 3, 1967

Shelby Jones Company, Inc.  
P.O. Box 514  
Havertown, Pennsylvania

Dear Sirs:

U. of Pa. P.O. #126508

Thank you for your note of February 1st. In unpacking the shipment, we noticed at the time that there were only 8 R327A valves in the box. After checking your packing slip, and finding 10 valves noted there, we rechecked the box and packing material with no further success. Hence my letter to you.

Naturally, we would be delighted if you could supply the other 2 valves. But if your stock matches your stock records, then there is some other explanation, and we will simply order another 2 valves with another purchase order.

Thank you for ordering the solder tube fittings. We'll light the soldering torch in anticipation.

Sincerely yours,

Robert Stuckenrath, jr.  
Radiocarbon Laboratory

# SHELBY JONES COMPANY, INC.

P. O. BOX 514 • HAVERTOWN, PENNSYLVANIA 19083

M E S S A G E

R E P L Y

TO [ 2/1/67 ]  
APPLIED SCIENCE CENTER FOR  
ARCHAEOLOGY  
UNIVERSITY MUSEUM  
UNIVERSITY OF PENNSYLVANIA  
[ PHILADELPHIA, PA ]

DATE  
ATTN: MR. ROBERT STUCKENRATH, Jr

RE: YOUR ORDER 126508

We have your letter of the 30th and after carefully checking our stock records and actual stock we find that 10 R 327 A Hoke valves were shipped you against the above order and not 8 pcs as you state in your letter. Perhaps two pcs are in the bottom of the box among the stuffing. Will you please give another check of your receiving dept and advise us if you do not locate the item. As to the solder tube fittings, you are correct in that 3 pcs only were shipped. This was all we had on our shelf and the balance of 5 pcs have been backed ordered. Shipment of this item will be made within the next few days.

BY

*Bill Davis*

DATE

SIGNED

RECIPIENT KEEP THIS COPY, RETURN WHITE COPY TO SENDER

May 8, 1967

Liquid Carbonic Division  
General Dynamics Corp.  
Front and Porter Sts.  
Philadelphia, Pa.

Gentlemen:

Under U. of P. PO #92151, your firm has been supplying this laboratory with two fifty pound blocks of dry ice every Monday. For some years, delivery has been made between 8:30 and 9:30 A.M. a very convenient time for us. Of late, however, deliveries have been made between 10:30 and 11:30 A.M. Delivery after 10:00 A.M. delays operation of our laboratory; delivery after 11:00 A.M. can completely prohibit a large portion of Monday operations. May we request, therefore, delivery before 10:00 A.M.?

Thank you.

Sincerely yours,

Robert Stuckenrath  
Radiocarbon Laboratory

RS:lm

June 16, 1967

The Matheson Co., Inc.  
P.O. Box 85  
East Rutherford, New Jersey

U. of Pa. P.O. #50175

Dear Sirs:

We have recently received the shipment of ten cylinders in the above purchase order; thank you for so speedy a delivery.

That order specified delivery to room BW4 and pick-up of empties there. Since this was not included in your shipping order to Engle Oostdyk, Inc. the girls working in this laboratory had great difficulty in persuading the delivery man to do other than dump the cylinders on the sidewalk.

In the future, please include this note on your shipping orders. The task of getting the cylinders from sidewalk to elevator is physically impossible for these girls.

Thank you,

Robert Stuckenrath, Jr.

RS/deh

cc: Engle Oostdyk, Inc.  
3800 Newportville Road  
Cornwall Heights, Pa.

465 Boulevard  
East Paterson, New Jersey

January 9, 1968

Sel-Rex Corporation  
Nutley, N. J.

Dear Sirs:

Will you please send us your catalog of plating equipment, accessories, and instruments. Our main interest is in the use of electrolysis equipment for the removal of corrosion on ancient metals.

Sincerely yours,

Elizabeth K. Ralph

EKR/ek

7/10/68  
Don't you think that  
even if you people couldn't  
help us, that common courtesy  
demands that you at least  
send some sort of reply

April 30, 1968

Baird-Atomic, Inc.  
33 University Road  
Cambridge, Mass. 02138

Gentlemen:

In the past we have been able to purchase  
Good-All Capacitors

TYPE 620  
.01 MFD  
3000 VDC

direct from the manufacturer. Apparently they  
have been taken over by TRW, Inc. who no longer  
manufactures this item.

Can you supply us with a capacitor of the  
same specifications or tell us where to get  
them? They are for use in Atomic Scales Model  
No. 1011 or 1020 B.

Thank you for your prompt attention.

Sincerely,

Barbara Lawn

BL/enf

## MASCA CESIUM MAGNETOMETERS

1. Varian Associates Precision Portable Cesium Magnetometer Model 4920.

This instrument was designed specifically for archaeological prospecting by Varian Associates (611 Hansen Way, Palo Alto, California 94303, U.S.A.) at the request of the University Museum, University of Pennsylvania. The components are the read-out, cesium sensor (or sensors) and 30-volt battery pack. It is lightweight and readily portable. Its maximum sensitivity with one sensor is 0.1 gamma. The principles of operation as well as its application in the search for Sybaris in southern Italy are described by E. K. Ralph, Frank Morrison, and D. P. O'Brien in "Archaeological Surveying Utilizing a High-Sensitivity Difference Magnetometer", Geoexploration, vol. 6 (1968) pp. 109-122.

The Model 4920 contains also a difference circuit for use with two sensors. The second sensor may be used either in a gradiometer arrangement or it may be placed in a fixed location in the center of a grid. The second sensor serves to cancel out diurnal and other extraneous magnetic variations, and only the difference between the fixed and movable sensors is read. When operated as a difference magnetometer, the second sensor replaces the crystal oscillator to regulate the counting interval. The readings are no longer in gammas ( $\gamma$ ),

but are adjusted to an arbitrary base reading of 80,000 units when the magnetic field at the two sensors is equal. The reading of the movable sensor may be converted to change in  $\gamma$  by the formula:

$$\Delta H = \frac{H_F}{80,000} [N - 80,000]$$

Where  $\Delta H$  is the difference in  $\gamma$  between the fixed and movable sensors,  $H_F$  is the total field intensity (in  $\gamma$ ) of the fixed sensor only; and  $N$  is the instrument reading in units. Since the total field intensity at Wissant was approximately 48,000  $\gamma$  at the time of the survey, in the difference mode of operation, the sensitivity of the instrument is roughly double ( 0.60  $\gamma$ /unit) than with one sensor only.

At sites with large anomalies of the order of 100  $\gamma$  or more, this extra sensitivity is not required, but use of the difference circuit eliminates the tedious process of correcting readings for diurnal changes. The great advantage of cesium and of other alkali vapor magnetometers over proton magnetometers is speed. The measurement display interval in this instrument may be selected on the basis of desired speed of operation, from a minimum of 1.5 seconds to infinite (or manual). A built-in memory circuit "holds" the former reading after its 1.5 second measurement cycle. In practice, the readings can be viewed continuously by the operator who can see when significant anomalies are encountered and slow down to record changes in

readings when anomalies are large. This prevents measurement slew resulting from the averaging done by the readout.

This cesium magnetometer is especially suitable for recording readings in a grid pattern.

2. Varian Associates Portable Search Magnetometer Model V-4971 - Audio Type.

This instrument consists also of a readout, one cesium sensor, and battery pack. The big difference is with the readout. This readout is very much smaller and simplified. It contains an oscillator which can be varied with a control knob to match the Larmor frequency from the sensor. This match is made by obtaining a "null" or zero beat frequency on the readout's built-in speaker. Then a reading can be taken from the calibrated dial attached to the control knob. The dial range is from 1 to 1000 and each unit is approximately equal to  $1\frac{1}{2}$   $\gamma$ . (There is a coarser control for bringing the dial into range in any particular magnetic field.) This readout is particularly suitable for doing rapid exploratory lines. One sets the dial at "null" and then while walking along, one need only listen to changes in the audio tone from the loudspeaker to know whether or not anomalies exist. If desired, one may pause to take a reading to find out the approximate magnitude of each anomaly.

This readout, referred to later as the "audio" readout, is most useful for preliminary exploration, and for finding the limits of sites beyond the areas covered in detail by grids. It is also the more suitable of the two for detecting narrow linear features such as shallow ditches.

### GRID PROCEDURE

In most cases, after preliminary exploration along lines with the audio readout, grids are laid out in the areas of interest, to be covered in detail with the precision readout. For each grid, two parallel lines (one at each end of the grid) are marked with stakes at 10-meter intervals with tape measures. A rope, calibrated in 2-meter intervals, is then strung between the end stakes of each line. The man carrying the sensor then walks along this line (the zero line) and the adjacent two- and four-meter lines and pauses at each two-meter marker for a reading to be taken. Upon the completion of the first three readings, he then moves 2 meters into the grid, three more readings are taken, and so on in a serpentine fashion along the edge of the grid. After the completion of three lines, the rope is moved between the and strung/ next 10 meter stakes, and the sensor man then moves to the six-, eight-, ten-, twelve-, and fourteen-meter stations at each two-meter marker on the rope, and traverses the grid again, but with a serpentine pattern now five measurements wide.

Each reading is called out by the man carrying the readout and batteries, and is recorded by a third person in a notebook oriented in the same direction as the grid being traversed. In bushy or rough terrain, a fourth person coils and uncoils the 100-meter cable leading to the fixed sensor. When the grid is finished, the pages of the notebook are then put together with

Scotch "magic-mending" tape to form the complete grid.

The differential mode with 2 sensors is usually used for all grids with the second sensor placed in a fixed position in the middle of each grid. The usual height of the movable sensor is in the comfortable position at arm's length at one's side - about 75 cm above the ground. Grids may be varied in size, but it is frequently convenient to lay them out in 100 x 100 meter squares. This area can be covered at 2-meter intervals in a six to eight hour work day, depending upon the terrain.

After a grid has been taped together, contour lines of equal magnetic intensity are then drawn for easy visualization of magnetic patterns. In these plots, "0" represents 80,000 units; "10" = 80,010 units; "990" = 79,990 units, etc. In most grids, with average anomalies, contours are drawn at intervals of 10 units, or approximately 5  $\gamma$ .

When several grids are made, one adjacent to another, the average base readings may be adjusted to be the same for each by placing an artificial anomaly such as a compass near the fixed sensor. Thus, a reading such as "40 units" in the second or subsequent grids represents the same difference in magnetism above background without anomalies (usually set at 20 units for convenience) as in the first grid. This aids in the interpretation of the final plots of magnetic contours by allowing adjacent grid maps to be connected directly together with no discontinuity.