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August 3, 1999

10-9-21

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New Mexico.

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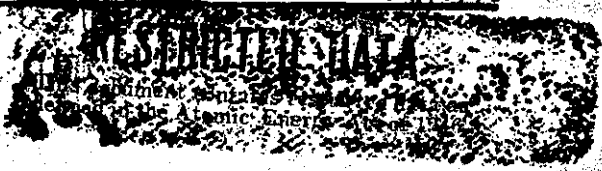
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EJM



Los Alamos Notebook #1

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Log of The Critical Mass Experiments at Los Alamos

March 20

May 13, 1946. 7:30 P.M. Sigma Bldg, Room 39F L. B. Beck

The original proposals and counter-proposals, conference minutes, reports of visits, etc., relating to this project are contained in Dr. Beck's file "Critical mass Experiments at Los Alamos" and in the black leather notebook.

Permission to perform the experiments, arrangements with L.A. for the program, assembling of materials and apparatus, securing personnel, making preliminary arrangements for the ensuing experiments at Oak Ridge, obtaining of preliminary data on plastic cube formation, etc., had been accomplished by the end of March 9.

Record of Material shipped by Truck.

At 10 A.M. Friday March 8, a 1 1/2 ton truck, loaded with supplies, was dispatched from Oak Ridge.

Drivers: C.E. Webber, Henry Ayle.

The Load: (4) wooden boxes 10 x 20 x 30" containing tools, books, clothing, etc.

- (1) 100 lb drum polyethylene tetrafluoroethylene.
- (1) 60 lb box 1" rectangular bars polyethylene.
- (1) 40 lb box 1" rectangular bars polyethylene.
- (1) 60 Ton Weaver hydraulic press - 84-7,
- (1) Arbor press -
- (1) small triple beam laboratory balance.
- (1) Micropulverizer with wood and stainless steel hook.

The arrival: The truck was overtaken by the auto (hub) in Santa Fe at noon on Tuesday March 12. The truck arrived at J.A. about 3:30 P.M. and was immediately unloaded, arrangements having been completed prior to its arrival. The supplies were in good condition.

The departure: The drivers stayed overnight in the apartment assigned to the K-25 personnel. The drivers requested the receiving report to be signed on the 13th rather than the 12th since they had been allotted until the 13th for the fix and intended to request payment on that basis. They asked to be allowed to stay in J.A. all day Wednesday not starting back until Thursday. Dr. Beck insisted that they get started back on Wed. morn. This they did.

Record of auto Trip to Los Alamos.

The army auto 3628, coach, with new tires and fresh engine overhaul, was assigned to the Critical Mass Group for transportation to L.A. and were there.

Passengers

Dr. A.D. Callihan

Mr. Wallace Teland

Mr. Joseph Schaffner

Dr. Clifford Beck

Mr. R. L. Murray (Y-12)

Itinerary

Fresh } Oak Ridge Sphometer 59034. Departure from Oliver Springs Gate at 7:30 A.M.
 day } Highway #70 to Nashville - Ar. 12 noon. Lunch at Press Rail. Beck driving. Stopped at Slacks 15"
 15th driving } Highway 70 to Memphis, supper at Peabody Hotel. Callihan driving also Schaffner.
 good day } Highway 64 to Searcy Ark - very rough roads - Ar. 12:15 spent night Beck driving.
 He has drive } To Ft. Smith Ark for lunch, road improving, Ar. noon. Callihan, Schaffner driving.
 } Highway 66 to El Reno (near Ok City) Ar. 6 PM. Beck driving. Supper at Southern Hotel.
 } Highway 66 to Amarillo Texas. Callihan Schaffner dr. Ar. at 12:15 midnight. Spent night.
 } Highway 66 to Santa Fe Ar. 2 PM. Callih. Schaffner. Breakfast. Got Passes for crew & truck driver.
 } Highway 84 to Los Alamos. Arrive 3:30 PM. Beck driving.

Total mileage Oak Ridge to Los Alamos - 1496 miles.

Total driving time about 37 hours.

Average driving speed 43.1 miles/hr.

Used about 88-90 gallons gas. = 2.1 or $2.2 = 17.7 - 18.2$ miles/gallon.

Used 13 qts oil (change) = \$4.41

Total cost = \$26.41

House Assignments.

Apartment C in House 163 - Upper, north, 3-Bedroom, living room, dining room, kitchen, bath, assigned to group. Apt in excellent condition. Floors bright and freshly polished - House across road from Sigma Building. good location. Deployment: Callihan & Beck in 1 room. Murray and Schaffner in 1, Teland in 1.

May 12
Log of May 12 at Los Alamos.

Arrived at 3:30 p.m. Checked through pass office, security lectures, etc. Arranged for and unloaded truck. Arranged to sleep in 163-C; took in the two truck drivers, too - sleep on cots in living room.

May 13
Log of May 13.

Room 13 Sign

Beck tried to arrange for furniture and linens etc for apt. extremely rough going; partial success. All hands working on setting up equipment. Most of effort going into setting up the press and getting it into working order. Serious doubts of the suitability of the press have arisen. There appears to be design limitations - 60 tons appears out of the achievable range - as well as mechanical defects: scored seat-face of check valve.

Returned after supper to investigate possibilities of altering press mechanism and to bring Log up to date.

Note book assignments

- | | |
|---------------------------------------|---|
| # 1 - Log of experiments | # 7. Log of T.O. → T.F. Conversion. |
| # 2 Water tank Fabrication | # 8. For Record of Material Recd. (black) |
| # 3 Electronic Circuits | # 9 |
| # 4 Fabrication continued | # 10 |
| # 5 | # 11 |
| # 6 | # 12 |
| | # 13. |

May 14
Log of May 14.

Continued efforts to get press into satisfactory operating condition. Attached another pump in parallel (borrowed from Los Alamos lab). Leaks in line bothering. Electricians patterning around apt. Turned down plate for base of die to rest on in press.

May 15
Log of May 15.

Press operating satisfactorily. Made a cube density 4.91 at 60 tons. Began work on cutting polyethylene into cubes. Discovered that sizes and shapes were very poor - almost impossible to make full sized 1" cubes. Reluctant milling machine to get it into working condition. Great treated and ground base plate for base of die to rest on in press.

May 16. Saturday
Log of May 16.

Beck came in, having been delayed 12 hrs enroute. Worked further on Polyethylene cubes. Decided to order more polyethylene from Plex - larger dimensions. Tried to call Plex. Failed. Called Tenney for two men from S.A.M. next week to assist in cube formation. Tenney said Kirby and Snyder could come, also Tranga if necessary. Tried to call fellows at S.A.M. Failed. Made cubes at different pressures. Decided to make cubes at about 45 tons pressure.

Sunday March 7.

Read reports of lab for 3 hours in A.M. Drove to Santa Fe to take Joe Schuffman to airport. Return via San Ildefonso.

Monday March 13 -

Conference with Sette (whole group) to discuss plans and arrange for transfer of material. Talk with Stetin. Making 3/15 or so of normal material up into cubes for experience and to crystallize procedures. Encountered trouble with pulverizer - made several cubes. Talked to Ploy. They will check up and see if additional polyethylene can be supplied at once (Roses).

Tuesday March 14. Made additional cubes of normal material. Took pulverizer completely apart, cleaned, adjusted, reassembled.

Wednesday, March 20.

Made fresh cubes - Uranium-plastic for use in the experiments - about 30. Ploy will send 50 lbs polyethylene in form 1 1/2" rods within 1 week by air express. 75 lbs thereafter by R.W. express and remainder (250) to Oak Ridge. Talked to Tenney. Snyder and Kirby coming Friday and Monday respectively.

Thursday. Continued making cubes.

Friday. Talked to Center, asked him to confirm Ploy order. Dick Snyder arrived in afternoon.

Saturday. Continued to make cubes. Stripped threads on screws control of check valve on small pump. Delay in making repairs. Total of 249 cubes made.

Sunday, 24th. Succeeded in reaching Don Hull, who decided to defer his visit out here until April 1. Drove over mountains behind reservation, climbed to top of "hill" - 11000 ft.

Monday, 25. Making cubes. Rate increasing. Kirby arrived at noon.

Tuesday, 26. Back work with Stetin to Test site. Took polyethylene rods for machined to fashion into 1" blocks. Production of cubes continuing at increasing pace. Callihan ill with cold; out part of day. 165 cubes produced.

Wednesday 27. Continued making cubes. The rate has increased sharply. 202 were produced today; A total of about 750.

Thursday 28th Continued making cubes. Rate steadily increasing.

Friday 29. Completed Uranium-Plastic cubes. - 1108 made. Truck was finished about 3 P.M. Remainder of day was spent in trip to the test site down in the Canyon.

Saturday 30. To Santa Fe to pick up polyethylene rods, shopping, etc.

Sunday 31. To Cave dweller ruins, Trijones Canyon.

Monday April 1. Don Hull arrived at noon. Kirby, Snyder calculating and cleaning up in Sigma. Remainder of crew to Pajarito to begin preparations for experiments. Arranging counters, circuits, etc. In the morning, discussed critical mass theory with P. Morrison.

Tuesday April 2. Driving out to Booth, Murray, Leland. Two hours in Pajarito Canyon, completing instrument set-up for the experiments. Remainder of day spent in reading reports. Callihan and Kirby repaired and returned the glass borrowed from Los Alamos Labs.

Wed. April 3. Reading reports until noon. E.T.B. start 4-7-46
PM. Repair lower scaler at Pajarito and wire up instruments in preparation for run on Thursday.
Beck set up in Z for Milling Polythene parallel rods

Thurs. April 4. Complete instrument wiring and check. Begin stacking cubes - no tamper or moderator. Complete multiplication experiment on untamped, unmoderated cube of maximum size. Snyder Mills parallel rods of polythene at Z.

Fri April 5. Repair upper scaler (bad solder joint) at Pajarito Booth, Murray. help with multiplication experiment on paraffin tamped, unmoderated cube. Lower counter went out Beck set up in Pajarito shop for cutting up plastic cubes from parallel rods Snyder continue milling at Z. Kirby off
Callihan - Hull - Kirby start clean up of prep room in Z Leland collects information for instruments needed at Oak Ridge.

Sat. - Am. work on lower counter which gave spurious counts on Fri.
Apr 6. Change counting tube and reset lead - Booth Murray Leland continue on instruments for Oak Ridge Snyder continue Milling at Z Callihan - Kirby continue clean up. (cont)

Beck set up lathes for cut off of plastic cubes in E
in case work interfered with at Pajarito
Hull cut off cubes at Pajarito
P.M. take Beck to Santa Fe for game to Oak Ridge
Booth & Callihan had hair cut.

Sunday Apr 7. AM. Callihan - Hull cut off cubes of Polythene at
Pajarito

E.T.B. - 4-7-46

Monday Apr 8

Today stacked 1000 cubes of TF₄ and Polythene
in ratios of 1:1. Stacked in box 10:10:10" I.D.C. on
paraffin base that critical without tamping of paraffin.
(Paraffin cut 6" wide, stacked in plates)

- 1) went critical with about 4 ^{paraffin} stacks, high all round
 - 2) 10x10x9 critical 6 1/2 high all round. (Paraffin tamped)
- Start stacking 9" cube box with 1:1

Tuesday Apr 9

After several approximations found 9" cube 1:1 went
critical fully tamped with 9x9x8 + 18 green cubes.
Total 342 cubes green.

Start stacking 2 white : 1 green cube array in 9" box.
Find it goes critical without tamping. Tomorrow, remove 1 layer
& repeat.
Hull returned to Oak Ridge.

Wednesday
Thurs
Friday

continued critical mass determinations for various assemblies.

Sat.
Sunday

Not much work; reading reports. Hiking and other recreation.

Monday April 15. continued critical mass determinations. Beck returned from Oak
Ridge late at night.

Tuesday April 16. Stacking in Borm containers

Wednesday April 17. Booth returned to New York.

Thursday April 18 } Beck suggested repeating the 1:1 point using 2:2, 4:4, 8:8
Friday } ratios. This was done and a discrepancy with the original
1:1 value was found. This proved to be due to use of plywood
box used on 1:1, which seemed to provide shielding,
to indicate a 5% or so lower critical mass.
Experiments on 2:1 and 1:1 were repeated - with same
result essentially.
Multiplication experiments on sub-critical assemblies of
1:1 ratios were used to establish the accuracy with which
this procedure indicated true value of critical mass.

Saturday April 20. Beck writing reports in P.M. others to Santa Fe to
take Callihan to airport. (Beck to leave for weekend).

Eastern Sunday April 21. - Fishing, reading, resting, in the
Rio Grande gorge near Taos.

Monday April 22. Continuing experiments. Capt. Gurnault of Y-12
arrived to spend several days with the group.

Tuesday. 23 Kirby left, somewhat ahead of anticipated
schedule, to go to Oak Ridge (via Texas). Callihan
returned.

Wednesday, 24. Dr. Nordheim, of X-10, spent half day in
discussing the experimental program.

Thurs
Fri.

25 } Density and parallelized experiments
26 } Auto checked out for return trip.
Talked to Taylor re visit to Alamosa, permission
granted.
Talked to Bradbury and requested reports, and sample
items of electronic equipment we have built. He
is willing, but will ask Peterson for O.K.

Saturday 27. Finished experiments.

Truck driver Scroggins called from Elk City, Okla. saying
there was engine trouble and arrival of truck would be
delayed to Monday night.

Sunday 28. Beck writing reports. Callihan cleaning up at Pajarito.

Monday. Cleaning up odds and ends, packing, checking out. The truck driver
called, saying there was more trouble - replaced two bearings at
Amarillo air base. Beck requested that they drive Monday
night in attempt to reach Los Alamos Tues. morning.

Tuesday April 29. Check up of final items. Truck arrived at 10 AM
and to be oiled, greased, checked. Loaded in afternoon.
The intention is to depart early tomorrow.

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Bufford Bush
June 1946

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