11897

Oxygen Titration—

Draw sample into amber bottle — add 1 shot each of 2 left bottles (Manganous sulfate & MOH-MI) shake but vigorously — ~~allow~~ put in box and allow to stand 3 mts. — Add one blast (actually, double the size) of the right reagent (H_2SO_4) and shake again. It then can stand in box for several hours.

To titrate — wash out 50 ml pipette with solution from sample, then add 50 ml to flask. Fill burette w/ thiosulfate to zero mark. If very yellow, start titration then add 6 drops starch as color fader — best to do this anyway except deep & ∴ low oxygen sample.

If first 2 samples not within 0.03 ml, do another —

Flask can be re-used sans washing, as there is no thio or iodine left to foul it up.

Wire length out goes in depth column.

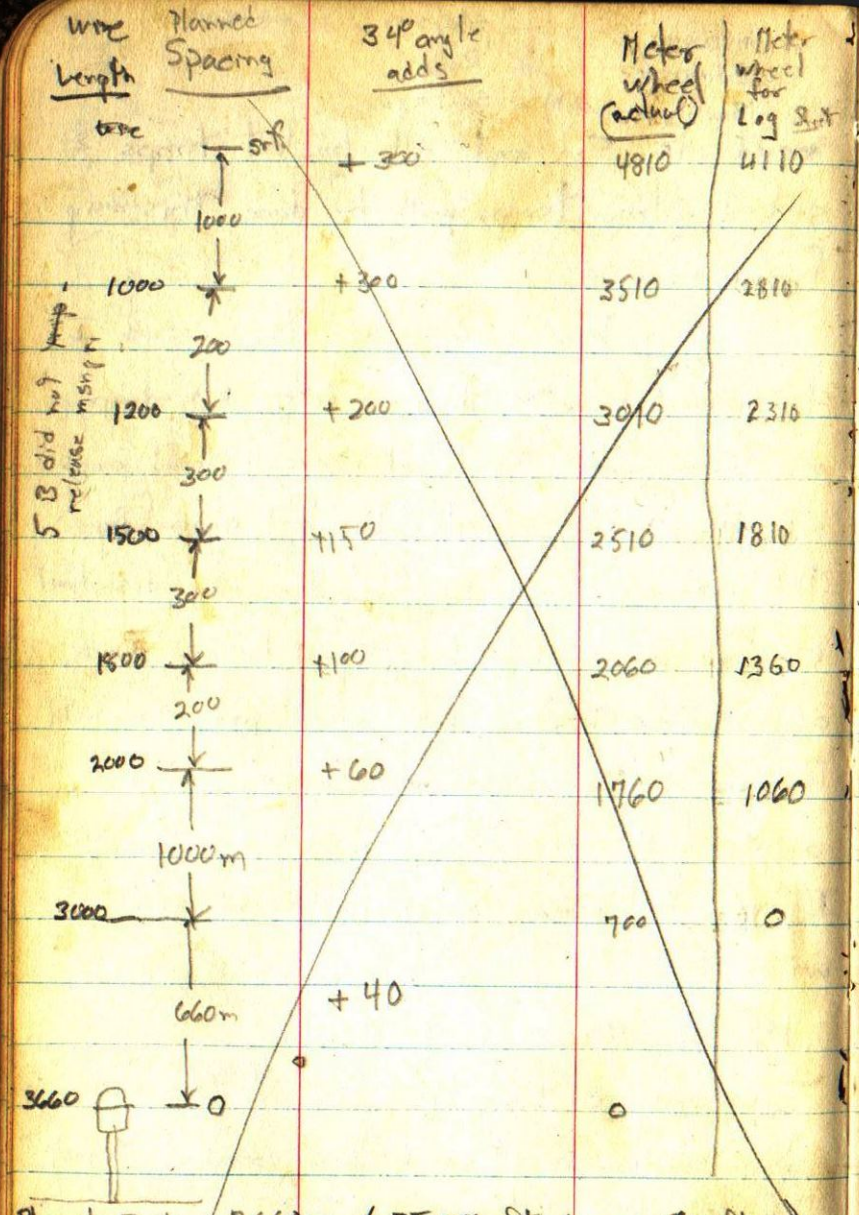
Lopes — — Slapsys 1200 & 1600
Bowers — — Reed
Burnham - (Bill) — Santiago

read to 0.1 and all bucket temps & srf & btm temps will be done this way from now on.

Since it has been some time since I have worked with Nansen bottles, I read up on them and then set several trial ones on the cable to get the feel again. By the same token I have done no dissolved oxygens since the San Miguel Lagoon work, and so went over the whole procedure with Ron Reed. The thiosulphate ~~fate~~ has a slow end point but runs about 5.93 or so tonight I hope to become more proficient at it with time

19 Feb - 1960

Once at sea the day of the week has no meaning, so I lose complete track of the ~~time~~ day. Actually I get confused as to the date too, since some of our records are Greenwich



Wire Length	Planned Spacing	34° angle adds	Meter wheel (actual)	Meter wheel for Log Start	wire depth
wire	srf	+ 300	4810	4110	
	1000				
1000		+ 300	3510	2810	1290
	200				
1200		+ 200	3010	2310	1790
	300				
1500		+150	2510	1810	2290
	300				
1800		+100	2060	1360	2740
	200				
2000		+ 60	1760	1060	3040
	1000m				
3000			700	0	4100
	660m	+ 40			
3660	0		0		

5 B did not release msngr

Bottle and cover arrangement on Station # 13.

Bottle 5B did not release messenger.

Planned Depth: 3660m (3587 at impact time)

Ball broke at 4061 m out & 34° wire ∡

Pulled up to 3957 for messenger

Deep casts.

Sta #	Depth (m)	Wire Out	Core?	Ball Bk?	Line out at Ball Bk	Time to come in	Total for all casts
12	2050	10'	Yes	No	–		
13	3660	34°	Yes	Yes	4061	45m	3h 45m

Civil Time and some are local time. The hour, though, I know!

~~After the casts came up from Sta #17, the night of the 17-18th, I stayed up~~ - see, lost track of days already,

Spent quite a while last night getting ready to run this station (#13). Cmdr. Stone had been in charge the night before, but he is now navigating and has to be up for morning and evening stars, so now the stations are mine,

It took quite a while to plan the bottle spacing and to get them all set. There had to be some switching of thermometers to remove the one with the leak in the reservoir, the ball-breaker &

cover had to be rigged for another go, sample bottles ready etc, and station assignments made. The procedure ran something like this when we arrived at ~~Station~~ B3 at 0020 this morning:

1) 900 ft BT lowered & read
2) Angus's velocity meter to go over for empty-case tests
3) While he does this, the 180 lb cast weight is lifted overside and free-wheeled out - no power, as drain to big when other winches are working. Then the 8 bottles are put on the line at pre-determined meter wheel readings & cast lowered into place, Messenger sent, time & wire angle noted, and 1st cast is brought in and handed.

directly through window into acco. lab. While we (Slapsys, & ~~Reed~~) drew samples for Salinity, Oxygen, Phosphate and Nitrite & read thermoms, I put on the 2nd cast with ~~Mr~~, Mr. Allen & Jarvis, When that came up, there was time for Mike (GMS-Chief) to put on corer & ball-breaker with me, When the last bottles were ready these went on & the third cast was lowered with the bottom ~~bottle cast 4100 m~~ at 1960fm. I had a 34° wire angle, so to get to 3587 m at the bottom, I figured 4810fm would be needed: (The corer was 660 m below bottom bottle) Broke out Chief Mears to check me out on switching the Edo &

So I had them raise 100 m to 3960 & released the messenger to trip the bottles. 20 minutes later, we

PDR so that I could hear the implosion & sat there with earphones on waiting for that welcome "plop" that means corer is on bottom. We had some 660 m of ~~extra~~ cable up to the lowest bottle, but I was still a bit leery of the possibility of dragging bottles with deep-sea thermometers along the bottom. When only 4061 meters were out - only 474 m more than the sonic depth - I heard the ball ~~of wax~~ started in. This was at 0317 this morning. The next to the bottom bottle had tripped but had not released its messenger, so there was no sample in bottom bottle.

The corer had indeed worked, and we had a good 572 cm long core of

red clay overlying gray-green clay.

I helped Reed with the Oxygens a bit, but by then it was after 0500, and I had been up since the Baird called at 0730 the day before, so I left a call for 0930 so I could get to the daily meeting with Capt. Somes, Cmdrs. Bull, Stone, and Crawford - a sort of planning session.

One problem is insufficient people! The magnetometer needs a man back in the plotting room full time. On future trips, they want to know just how many people will be needed to run the gear that comes aboard, how much space it will take up, and what power will be needed. The EX is low on AC, & we have lots of it that is needed.

The net tows have been going well, but cans thrown over were also caught and have cut up one net that Dougall Reith is now patching. Catches have been large, mainly crabs to date.

I worked up the wire length data for last night's station, and then prepared and stored last night's core in the box outside the core lab.

When things ease off a bit, I will start plotting the BT's we have taken since San Diego. Now getting a good thermocline at about 290 ft. To get the 900 ft one to 900 ft. on station takes 1200 ft. of cable. The 450 ft one underway takes about ~~1400~~ 1100 ft to get a good trace.

Argyle's velocity meter still not working properly. I have asked him to get on paper — when he has time — what the problems have been.

One bottle on last night's cast had a loose stopcock, & we lost about ½ the water — got the O_2 & $^0/_{00}$ samples but no Phosphate or Nitrites.

It is now 1430 on the 19th. There is a slow swell running and whitecaps, but the gentle roll is good. I hope it holds. Winds were higher this early AM on the east, & it was chilly. No sun under a stratonimbus sky, but the weather still looks good. The

next station comes at 0400 tomorrow. I'll be glad when we can make a station in daylight for a change. I'd best fix the bottles that need repair now and get set for tonights station.

The water has been off since we left San Diego & I am pretty ripe and very dirty. I don't mind getting dirty, but I hate to stay that way. By saving water, we can ballast ship with water rather than fuel & should be able to steam at full speed all the way between stations.

Nets at 1, 4, 7, & 10 hours

Have put up a list of all that is done regularly every hour of the 24, & it was quite impressive At present we have a BT every

Bottle arrangement for Sta # 14

1st Cast	2nd Cast	3rd Cast
1A P – (16)	5A Pu	3 Pu
3 Pu	16 PP (15)	19 Pu
2A PP	2B Pu	14 PP
19 Pu	8 PP	23B Pu
14 PP	23A Pu	5B Pu
23B Pu	24 Pu	7 Pu
5B Pu	13 Pu	
7 Pu		

(P= Protected thermom., U= Unprotected thermom.)

hour on the ½ hour, ten drift bottles go over every 2 hours on the even numbered hours, the nekton net is pulled aboard and ~~and~~ replaced every three hours at 1, 4, 7, 10, 13, 16, 19, & 22 hrs, ~~and~~ the magnetometer is checked every hour on the hours, DR posits. every hour, fathometer read every few minutes, and the full-scale oceanographic stations have been coming about every 25 hours – & all at night. The only thing not coming at regular hours is sleep. It was 0530 this AM and up at 0930 & it is now 2215 & I have a call in for 0200 hr to get set for sta # 14 on the 20th Nansen Bottles are checked and in order,

cover & ball-breaker ready, and the A sheet made out & ready to go. If Mike Stapsys doesn't fuel he can run the standardization titrations for the thiosulphate, he will call me at 0100, So it goes- busy, but it is good to get to sea again & everyone is doing his best to make the trip a success.

~~to February~~

~~Sta #14~~ see next page

			Mtr wheel Planned	Mtr wheel used	Wire Depth
50 ft					
1000					
	+200	+50	3660	3860	8
1000					
200	+200	+30	2610	2810	19
1200					
300	+150	+25	2380	2580	14
1500					
300	+100	+20	2055	2255	23
1800					
200	+80	+15	1735	1935	5
2000					
1000	+60	+20	1520	1720	4
3000					
			500	700	
480	+40	+20			
0			0	0	

wire ∡ 15°

3480 m

Pulled up to 3860 for messenger, 20

1920
1.83
5760
15360
19200
351360

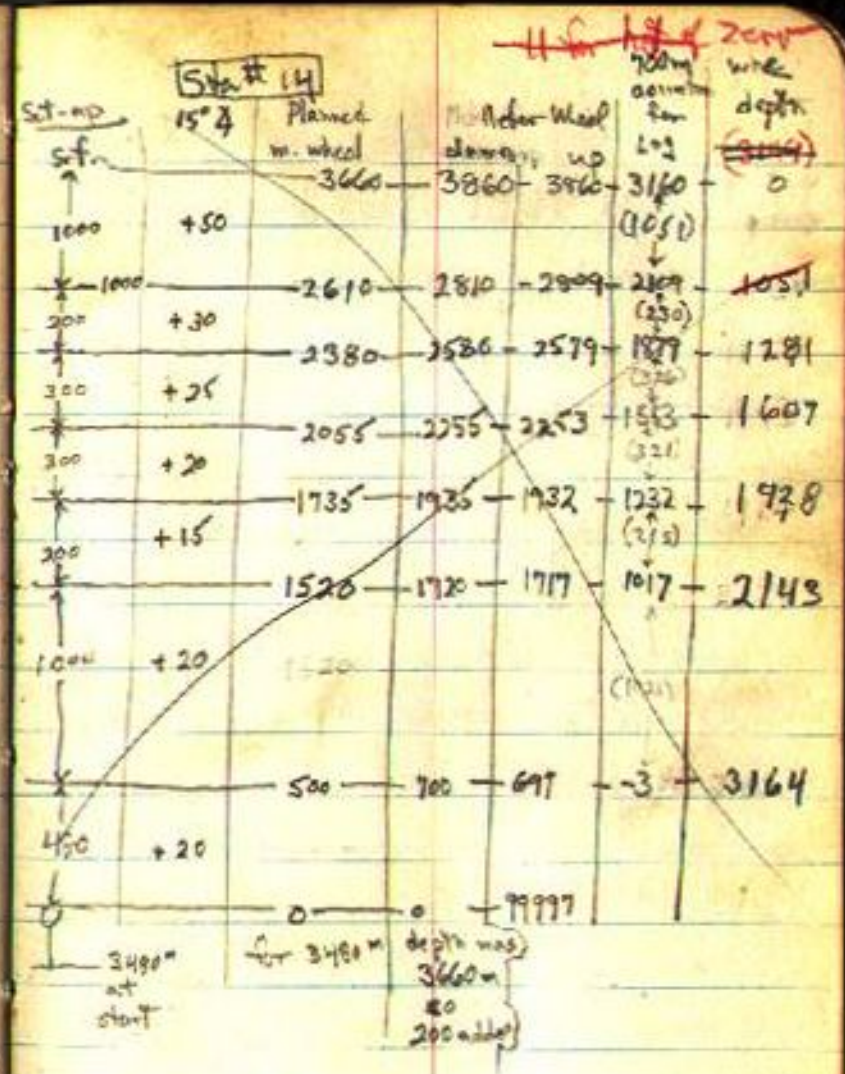
New Bull Bkr Pin needed

3500 @
3600 @ 0540
3700 @ 0541
3800 @ 0542
3860 @ 0543
4000 @ 0544
Break @ 4100 m @ 0545
— 2050 fms —
~~3860 m~~
brought back to 3860 @ 0551
messenger should take 20 mts,
start in @ 0611
2809 meter reading when 1st bottle
recovered – put on at 2810
~~Grease oil leaks slowly from just inside~~
~~nigger head of winch.~~

2253 ins stead of 2255 700 @ 697
1932 " " 1935
1717 " " 1920

'91.44

0646 winch cut out with 1083 m still out - line got overloaded - Back in at 0709. Trouble was in the circuit breaker & no juice was getting through to the control board 0721 winch kicked out again with only 25 m to go.
0732 off
Core up at 0733
Circuit breaker is at 200 amps
Markey figured 190 would be Max.
Winch dynamometer just does not operate - also scale is pretty coarse, One retrd. is only 6000 meters
Counter does not operate on a straight pull - using a sheave to raise angle of approach to fairlead helps - Now using Rimco Mk. 1. Drop or niggerhead



is slight but this helps keep the wrench greased.

~~20 February 1960~~

3.5
4
3
10.5

20 Feb., 1960

Last night was a real nerve shatterer! The time on station was moved up to 0230, as we have been making nearly 13 knots. I left a call for 0115 & I totaled up a record-crushing 3 hrs. of sleep last night for a grand total of 10.5 hours of peaceful slumber since we left ~~Long~~ San Diego ~~Three~~ days (actually 71 hrs) ago. That's an average of 3½ hours per day & I really need 4 !!! It's now 1100, & I am for the sack. Was awakened at 1500 (14.5 now total wheel) to check with Carl Shipek to see that all was ready for his first camera station. We were ~~the~~ there at 1625 and at 1637 the NEL deep-sea camera ~~station~~ entered

Sea & swell data - wind dir & vel.

Keep POR on -

the water in 3660m at 115° W 20° N. The sea and swell are from the north & a 24 mph wind is blowing from the north to produce 4.5 ft waves & whitecaps. The sky is partly cloudy, but I think Ray Stone will be able to get evening stars so Carl will have a good position for his start of the 10 camera stations.

Don't know if it is really worth recounting the problems on that station last night (#14) or not. Perhaps for the sake of completeness it would be worthwile to make an attempt at it.

Here we are keeping a close track of the time so we can hit Panama on

the 3rd of March, and to have everything possible happen at one station is hard on the old equinimity.

From Seattle to San Diego the oceanographic gremlins were on the bridge - radar conked out for no apparent reason, then all the lights up there went out. The telephone still is poor, but that was out too for a while. As we left San Diego, they moved back to the fantail and into Angie's velocity meter. He had had two leaky lowerings when - in spite of all precautions - water seeped in around the packing gland. When his velocity meter lowering went off without a hitch last night,

I should have suspected that ~~they~~ the gremlins might get interested in the oceanographic bottle casts, and they certainly did. on Sta # 14

The first cast was made up and put in the racks in the lab all ready to be handed out the window to go on the wire. The second cast was made up and was in the weather deck rack next to the winch. The 3rd or deep cast would have to be made up of 1st cast bottles after the samples had been drawn and the thermoms read. All was ready. The first cast started down at ~~0314~~ 0245 to go to 150m. with only 50 m to go

Coming in Bottle # 14 - the 5th bottle down on an 8 bottle cast - post-tripped at the surface, and we watched in the patch of light where the wire enters the water as the messenger was released from

the bottle and leisurely – almost as though it knew what it was doing to me and reveled in it – slid on down to trip the remaining 3 bottles some 20 m above their proper depths. There was nothing for it but to run to the lab & have them hold off on drawing samples. We handed in the next two bottles as they came up, and then went through the ~~relate~~ process of putting the whole cast down to try again. By 0325 it was down and I released the tripping messenger. Holding the wire I could feel the first few bottles trip properly. ~~This trip~~ On the first cast, I noted that the top bottle – #11 – had a missing messenger flat as it came in so had substituted #16 from the second cast. Now I had to replace #16 to be ready for the mid-cast. Things were

~~busy~~ busy as we rigged it 25 to take its place. And it was all just as confusing as it sounds.

By 0332 the ~~cast had~~ second try for a shallow cast was on it's way up, and I was glad to see that #14 had tripped - but!! as it came up, I saw its messenger had not released & was just barely held in place. If it dropped now, we would have to do it all over again. I leaned far down and clamped my hand on the stubby messenger as the bottle reached the platform. It did not drop. Since the lower 3 bottles had not tripped these were again lowered to their proper depth, and I put the messenger on the wire at 0416 & sent it down. This time all was OK.

The second or mid-cast went off OK. This had 7 bottles to go be-

1000 m. This was back aboard by 0445. We had the corer & ball-breaker all set to act as a cast-weight & to get our core on the bottle cast line at the same time we get the deep water samples. It had worked twice before – I hoped it would work again.

The deep cast with bottles at 1000m, 1200m, 1500m, 1800m, 2000m, & 3000m started down at 0511. The bottom by now was at 1980 fathoms (11850 feet or over 2 miles down) and I hoped to put a sediment core into the bottom without putting the bottles above it on the bottom too. In meters, that's 3623m to the bottom. The wire angle was 15° at the surface, so about 200 extra meters should have been adequate. Actually I could put down 700 extra meters of cable after the corer was on bottom before the first

bottle would get into the mud, but I hoped the ball-breaker device would let me know when the core hit bottom.

This ball-breaker is a heavy weight with a sharp point that breaks a glass ball when tension is taken off the line - that is, when the corer to which it is attached hits bottom. As the ball shatters at those large pressures (that's over 5000 pounds per square inch at these depths) the explosion (implosion, actually) can be heard through ~~the~~ headphones ~~of~~ plugged into our echo sounding equipment. I switched the PDP from Run through Synchro to Start, turned off the EDO ping, turned up the gain and listened. I could hear various noises, little crackling static-like

sounds, a long whistle that may have been a whale – we're pretty far off shore for porpoises who else whistle – but no ~~bottle~~ implosion. I had them call out ~~the~~ to me the amount of cable that was down – 3500 meters, 3600, 3700 – now I had out more cable than the water was deep – 3800, 3900, and still no definite break sound, although there were several non-descript "plops" any one of which might have been it, but I couldn't be sure. 4000 – now I had out 400 ~~feet~~ meters more cable than the water was deep. At 4100 m. I had them stop. Just at 4100 there was a "plop" that might have been it, but it wasn't definite. I had it hauled back up to the proper bottle depth and the

tripping messenger went down for its two-mile trip at 0557. By 0611 it should have completed its trip, and the big Markey winch that Scripps had lent us started the long complaining ~~[illegible]~~ pull to get back our gear and - I hoped - our samples. By 0645 we had all but one bottle in when the winch quit - just stopped running. I looked over at Chief Grant Lewis expecting him to tell me why he had stopped it - then I realized HE hadn't, and he looked down at the winch as though it would tell him why it had stopped. Both of us knew, really. That is a long pull, and the electrical system became so overloaded that the circuit-breaker cut out. ~~[illegible]~~ At 0709 it was

fixed, and again the ~~agonizing~~ low-pitched whine, the tone rising and falling as the ship's roll varies the tension on the winch. At 0721 she cut out again with only 25 meters to go to have the ball-breaker and corer break the surface. Ten minutes later came that welcome whine, and at 0733 some 5 hours after we had started the first bottle down, we had the corer aboard, and the down position of the ball-breaker and trip weight showed we had hit bottom.

The core was a good one - 27 inches of red clay packed tightly into the clear plastic core liner of our Phleger corer. Dr. Fred Phleger came aboard while we were in San Diego, and

he would have been proud of his corer this trip.

Interesting that the first core was all ~~blue~~ grey-green clay, the second red clay over grey-green clay, and the third all red clay. The core was good, but I was covered with grease from cables, winch, and corer, salt water from wet bottles, and now red-mud from the core; but the station was completed, I hardly looked the neat, clean, suited man with a briefcase who walks from Dupont Circle to ~~the~~ his Coast Survey office in Washington each morning, but this is important — and, what's more important — I like it.

Helped the watch a bit with the oxygen titrations, but I was too tired to do them well, so I quit. Had a good breakfast of pancakes and eggs and then

worked on the Station data sheet for a while, changed clothes after cleaning up and was in the Captain's cabin at 1000 for our daily staff meeting.

By 1100 I was asleep and Cmdr. Stone - as requested - woke me at 1500 so I could work with Carl Shipek on the first camera station.

He has the ~~DSG~~ NEL deep sea camera that he has worked with and developed for some years. We arrived at the first station at 20°N, 115°W at 1625, and the camera was over by 1647. Everyone was out with his own camera to watch. Carl brought along the NEL tension meter and could tell when the camera was on bottom.

His first station was with black & white film in 2000 fms. He took about 19 pictures by bouncing the camera

and two short corers attached showed a good red clay just like the one we got last night.

His second station (Ex-14-6) is now (at 2236) just up. This trip he used color & the short corers collected several small nodules, and one of them evidently cut into a larger one, for a cut-out piece of crust was in the core nose. I suggested that he wash one off & give it to Captain Jones for a souvenir.

I plan to label last night's core now and head to bed.

Between stations — some 20 miles apart — we stream the magnetometer, but the net is secured. At 450-ft BT comes right after each station and 10 drift bottles go over at the same time.

Conference 1000 21 Feb.

Night orders—

Two satisfactory ~~ten~~ motor whaleboats would mean that one launch could go. Then CPO mess space could be ocean. lab. & cpo mess would be off & crew's mess fwd. This by cutting out bunks so that crew of 70 is aboard.

It is now 1600, and the 7th camera station (Ex-14-G) is just up the wire angle was some 50° and even with 500 extra meters, it never got to the bottom. The winch kicked out twice during recovery. I took some photos of it & of the balloon release. ~~The camera dope is summarized on the next page.~~

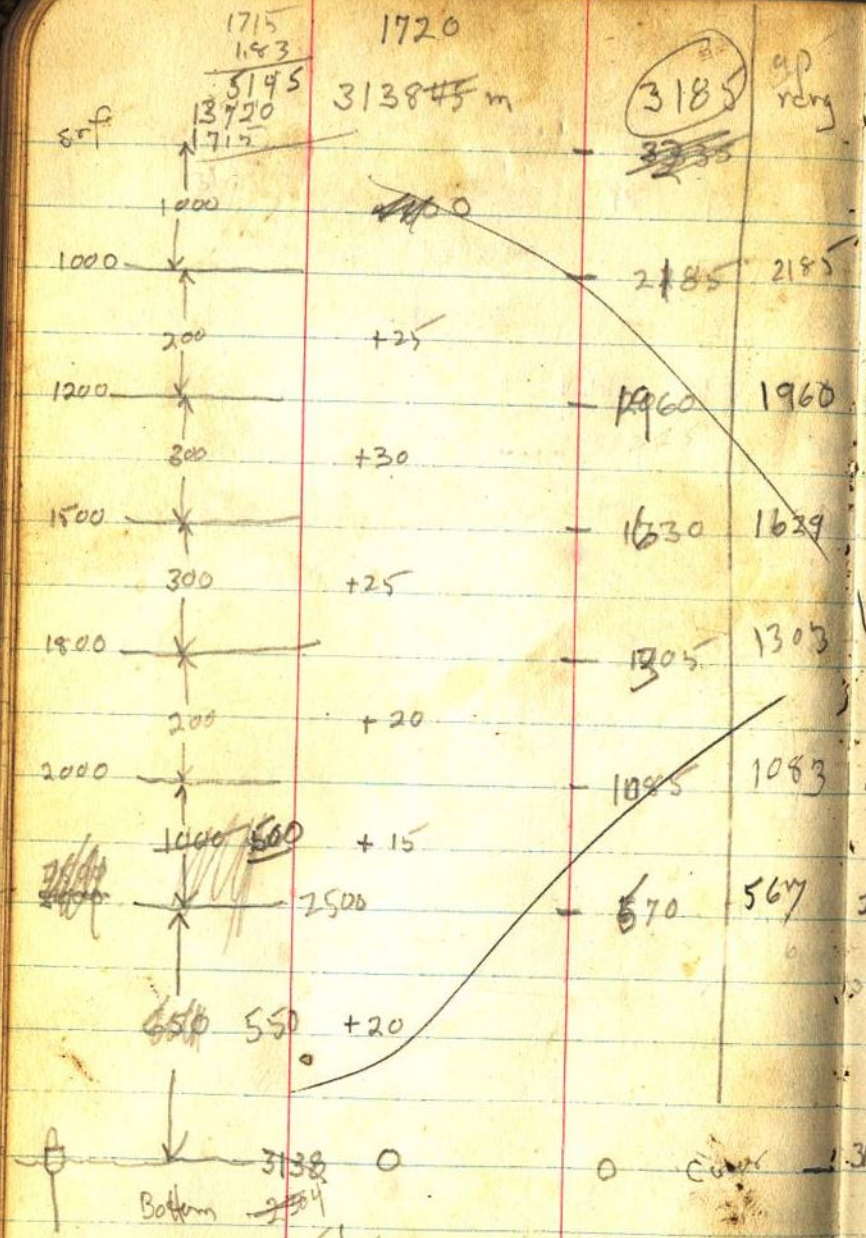
22 Feb, 1960—

0915. Carl's last two camera stations never touched bottom. After #7 (14-G) Carl, Capt. Jones, Cmdr. Bull, & I talked over the possibility of steaming slowly to maintain the wire angle at a low degree. This would involve coming on station with the wind a point or two off the port bow. It did keep the wire angle down, but just never left the camera

— Camera Stations —

14 —	A	B	C	D	E	F	G	H	I	J
Date	20	20	20	21	21	21	21	21	21	
Time Dn	1637	2015	2340	0312	0650	1004	1336			
Time Up.	1828	2200	0130	0455	0850	1200	1552			
Depth	3660 m	3431	3558	3477	3403	3443	3239	3520	3559	
Wire ∠	35°	10°	15°	40°	30°	?	45°	30°	15°	—
Line to bottom	3980	3661	3853	3792	3696	3680	never reached			
Photos (?)	19	20	19	20	23	18	0			

∠		Depth	Line to btm.	Diff.
5–10	(5)	3431	3616	190
	(8)	3431	3637	210
	(10)	~~3431~~	3651	220
	(10)	3558	3782	220
~~10~~–15	(12)	3558	3802	240
	(15)	3558	3553 ~~3547~~	290
	(25)	3660	3925	260
	(30)	3660	3958	300
	(35)	3660	3978	320
	(40)	3477	3765	280
	(40)	3477	3792	310



1715	1720							
1.83								
5145	3138 ~~45~~ m	3185	up rdng	uncor. Line depth (3100)	con. line depth (3100)	Sta #15	1670	Since 3185 would be 1000 ft above 1st bottle, 3100 is only 915 m above it
13720				0	0		1.38	
1715							13360	
srf							8010	
							1670	
							23040	
1000	~~1100~~ 0							
1000		2185	2185	915	915			
200	+25					1682	3	
1200		1960	1960	1140	1140	1.83	19	
300	+30					5046	14	
1500		1630	1629	1470	1471	13456	23B	2:40
300	+25					1682	5B	
1800		1305	1303	1795	1797	3078 ~~00~~	7	
200	+20							
2000		1085	1083	2015	2017			
1000 ~~500~~	+15							
~~2500~~	2500	570	567	2530	2533			
~~550~~ 550	+20							
3138	0	0	Cover	3100	3097			

Bottom ~~2504~~

Depth 3056

at 3450 no B brk

3133 @ 0724

2530 Ilsngr line — 0726

564

3097 — pulled up to 3100 @ 0726

— depth is 1682 fm —

Start up 0749 0813 up

3100 @ 1284 winch cut out

1278,

Switch brass ring on blkr. to steel

one wore & then cracked

bottom I sacked out about 2200 with a call left for 0415. I helped mike with the thiosulfate standardization, ~~got~~ checked the bottles, and we were ready to start when we got on station at 0500. The BT went over first, - a 900-footer, but at 1100 m of cable out, it was noted that the first sheave outboard of the winch had frozen & the cable had chewed into it almost to the center. There was quite a scurry to find another and the old one was replaced, but it was 0530 before it was in & I could start the big winch. The depth was ~~1760~~ 1715 fms (3138 m) at the start, & in the top 2 casts all went well. By the time we started the 3rd, the depth had shoaled to 1670 fm ~~1734~~ (3056m), so I adjusted the

Get wire & data from SIO
Orders to read - report aboard - so skipper can log them in

22 Feb

Winch - Since recorder did not work, it & dynamometer were rerouted. Forward of 3 sheaves was frozen & had been cut to. All 3 have too shallow grooves.

planned depths for the bottles & corer to put the corer 570 m below the bottom bottle, then 6 bottles, with the top one 1050 m of cable below the surface. The wire angle was only 8°, so I figured the ball on the corer should break at about 3165 m when the top bottle was just at 1000 m. I hooked up the phones to the PDR & waited. Again the depths were called out to me, and I got a distinct "plop" at 0724 with 3133 m out. It was just about where it should have been, but when it came up, there was the ball still in place, the corer not released. That "plop" must have been a wrench dropped ~~on~~ on the ~~steel~~ deck. Other than this the station was routine.

1315 - The net was just recovered

Phosphate determinations

1) Duplicate smpls. from each Nansen Bottle in serially numbered bottles. Amt. (700 ml.) set by putting in ~~two~~ one shot of metering jug.

2) Add 1 ml. molybdic acid, & 0.2 ml $SnCl_2$ from automatic dispenser 1st run one shot through each dispenser

Cell check - clear windows, Balance aft cell with Drk Cnt, & w window closed - balance blank with sensitivity. Slit with of .04 wave length of 700, Save ~~cell~~ cell of .029, then snap shutter & check from 1 beck to check.

Rinse recycle blnks 3 times. Add moly 1 ml (inotch) to each smpl.

- that is, the ring was recovered, but the net itself had been torn away clean. There had been some chafing by the depressor chain, but that part was still there. Perhaps we caught something too big & it just tore out.

About 1000 this morning, Dennis caught a 5-foot shark. I had seen him through the clear water nosing around the oceanographic cable while the last cast was coming in. He hooked him off the bow & draged him in. The white tip on his fin said he was a Great White Shark - maneater. I doubt if the boys who took a dip off the ship yesterday will be quite so eager this trip.

Thermom. # 7014 developed a cork leak & and loose Hg was running all through it. It was discarded.

BT # 11907 (450') retired. It banged alongside as it was being towed in. It sheared off a fin pin & banged up the stylus lifter. It was added to the one retired during the rough weather from Seattle to San Diego. (# 12088).

Staff Mtng: 23 Feb:
Swan Is. plan.

Mr. Ruff has aboard the map of magnetic anomalies off part of the West Coast - the result of the Pioneer Surveys. He also has Ronald Mason's paper on ~~the~~ it: "A magnetic Survey off the West Coast of ~~North America~~ the United States between latitudes 32° & 36° N and longitudes 121° and 128°W" ~~Some~~ Geoph. Journ. of Roy. Astron. Soc. V. 1, pp 320-329, 1958, Mason, R.G. ~~$10 contrib?~~.

23 February -

Things still go at a pretty fast clip. On the 22nd LeRoy Nordahl got a balloon up to 118,090 feet while we had a cover - and got a cove - at 12,000 feet. His may be higher than ours is deep, but we went all

Deep Cast Sta # 16 – 23 Feb. '60

Add for wire ∡	Meter rdng down	Bot	Meter Rdng up	uncor. Line depth	Cor. Line depth
srf.					
1000 + 50	3830	srf.	3830	0	0
1000	2780	2A	2778	1050	1052
200 + 15	2565	3	2563	1265	1267
1200					
300 + 20					
1500	2245	19	2243	1585	1587
300 + 15					
1800	1930	14	1928	1900	1902
200 + 10					
2000	1720	23B			
1000					
2000	700	5B			
~~530~~ +20 670+30	30	7			
corer ~~3532~~ 3678	0	core			

Bottle at 1900 did not trip so no samples below this pt.

I	II	III
16	5A	3
3	25	19
2A	2B	14
19	8	23B
14	23A	5B
23B	24	7
5B	13	(2A)
7		

~~120~~ 15°

$\boxed{\text{3900 Typhus}}$

3650
3700
3750
3800
3850
3900
3950

1930
1.83
5790
15440
1930
3532.90

2010
6030
16080
2010
36783
18
$\boxed{36196}$

Btm 3696

To 3950 w/ no ball break @ 1258 pulled up to 3830 @ 1258.
Bottle inadvertantly placed at 30m above corer!!
On way up, bottle 14 did not trip – ∴ no smpls

— Bottle Sand —

Mark Winch & count

Beers Law run — standard No. 2
Use wine flask of ~~low phosphate seawater~~ — 4 ml of standard #1 which is
down in ~~refer~~ cover added to 496 ml of low phosphate seawater.
Use dilution series as shown on board. Pipettes all set for
each dilution. Wash pipette to wet it down (with standard). Each dilution
done on two smpls.

the way to the bottom, and his top is a good deal higher than 118,090 ft. Even though we are actually on the interface ~~the boundary~~ between the ~~sea~~ hydrosphere and the atmosphere — the boundry between sea and air — we are probing deep into one and high into the other.

Last evening I ran the spectrophotometer readings on the 21 nitrite samples from station #15. I was at it some 2 hours just getting the feel of it, & the results checked OK internally, but I fear Douyall Reith has reagent problems somehow, the values look pretty poor.

Today I got everything set for Station #16. 1st two casts went well, but while I was below on the main deck getting the corer

rigged & ready to go & then down to 30m, someone put on the first bottle - the one that should be ~~at~~ 700 m above the corer - at only 30m above. I never discovered this until the winch stopped for the last bottle to be put on & there were no more. I was stunned!! Then Mrs. Allen said someone had handed him one, and he had put it on. Anyway here we were with 2 miles of cable out with a corer on the end and a bottle holding expensive and very delicate deep-sea reversing thermometers only 30 m (95 feet) above a heavy corer that I hoped would hit bottom. If only 95 feet of cable were put out after the corer hit bottom, I would be dragging that bottle through

~~3950~~
~~3690~~
~~260~~ 44

the mud. I could hear no sound from the ball breaker after I had put down an extra 260 m to compensate for a 15° wire angle, and I felt that should be about right, but still no sound. Any more would have been silly, so I had Chief Willis start winching up. ~~Bottle~~ The 4th bottle down had not tripped (#14), so the three below had no sample. I went into a huddle with Ray Stone & the Capt. & we decided to pull it on in rather than shoot 2 more hours for 3 samples.

That bottom bottle ~~came up with~~ - the one only 30m above the cover - came up and there was no mud, no indication it had been on bottom that was a relief

Byron Hulz wanted to shoot pictures of the corer coming up, but I warned him that the chances of a core were pretty poor - yet there it was, our longest yet and just jammed with red clay. How it happened, I'm not yet sure. To have hit the bottom at 3680 m using 3950 m of cable and still not overshooting by 30 m is incredible. Since the wire does not hang straight it takes more cable than the water is deep to get there, but how much more? That is the problem, and I nailed it within 30 meters when not to have would have cost either us a bottle or no core. I'm still appalled It was all too confusing to explain to people, so I just record

out in privacy
it here as a balm I can bring ~~out~~ if my ego gets bruised some day.

Now for Drift Bottles: ~~It~~ small amount of sand was used to ballast the drift bottles out of Seattle so that they would float with only a wee bit sticking out of the water to offer wind resistance - we are using them to learn about currents, not winds. This AM they bobbed back to the surface after they were dumped - albeit sluggishly. But late this afternoon none came up. ~~If~~ the surface water temp is now up to 80°F & it is too low a density to float the bottles ballasted for the colder - water off Oregon & California.

Used a garbage can full of water to check them, and we

San Diego – Panama – Summary

Sta.	Date GCT	Lat	Long	Depth M	Max Smpl Depth	Cl	O_2	$PO_4^{\equiv}$	NO_2^-	Smpler
12	2/18	31°00'N	116°56'W	2050	1500	19	19	19	19	#1
13	2/19	26°35'N	115°06'W	3587	3000	20	20	20	20	#2
14	2/20	21°46'N	115°01'W	3623	3164	20	19	20	14	#3
15	2/22	17°29'N	112°15'W	3078	2533	21	21	21	21	—
16	2/23	14°26'N	107°16'W	3678	1587	18	18	18	18	#4
17	2/25	12°30'N	102°52'W	2928	2663	21	21	20	0	#5
18	2/25	12°30N	97°36'W	3660	3144	21	21	21	0	#6 Mx.
19	2/27	10°53'N	92°28'W	3725	3102	21	21	21	0	#7
20	2/29	08°54'N	88°26'W	2964	2591	21	21	21	0	#8
21	3/1	07°17'N	82°31'W	3221	1857	18	18	18	0	#9

Cast Times – & depths

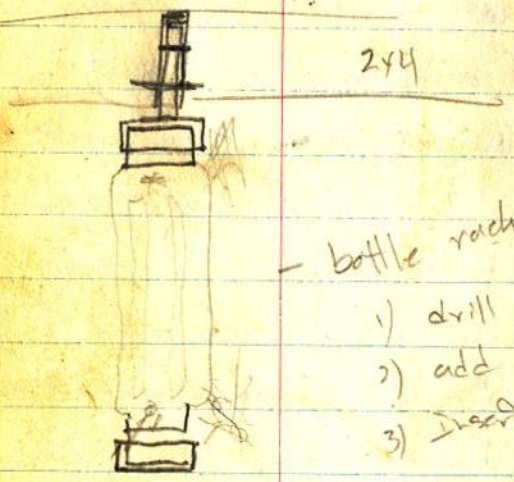
12	3:09 (2050)	18	2:37 (3660)
13	3:44 (3587)	19	3:08 (3725)
14	3:55 (3623)	20	2:31 (2964)
15	2:41 (3078)	21	2:59 (3221)
16	3:10 (3678)		
17	2:41 (2928)		

are using ½ the amount tonight & will go to completely unballasted bottles tomorrow.

We switched to +7 time zone last night (105° meridian or MT. Standard) and had trouble getting the records unscrambled. Greenwich Civil Time is still GCT no matter how many time zones you cross – somehow this concept was difficult for our oceanographic helper to get. Anyway the records are now all straight.

It is now 2100 & I'm to bed 'till 0500 when I want to get started on the BT profile from S.D. to here.

Write Bob Silkey - can make
narsen bottles cheaper — & with
interchangable parts.



over generally smooth bottom

0912 – 1024 24 Feb (105th Naval Time) 48

A strong magnetic anomaly recorded. Since we do not have aboard known seamount locations, and since Art Raff was not certain that this indicated a nearby seamount, since S.I.O. does get down here regularly, & since we are a bit squeezed for time, we decided not to investigate it further but to record times & locations & write Menard from Panama. Low was about 400 gamma below background, high about 300 above.

In afternoon, I spread the cable-holder at the top of bottle #14, so this time it will trip. Just in case, we will put it at the top of the cast & move the others down 1 peg. Cast No. 1 will now be 14

16

3

2A

19

23B

6B

Sta #17 Cast Cast #2 Wire ∡ 12°
Deep Cast Cast #3 " " 15°

Depth	Wire ∡ Cor.	Meter Rdng.	up reading	Line Depth
— s.f —		-3110 (s.f)	3110	0
↑ 1000	+50			
↓ —1000—		-2060 (3)	2059 1051	1051
↑ 200	+30			
↓ —1200—		-1830 (2A)	1828	1282
↑ 300	+20			
↓ —1500—		-1510 (19)	1508	1602
↑ 300	+25			
↓ —1800—		-1185 (23B)	1185	1925
↑ 200	+15			
↓ —2000—		-970 (5B)	967	~~2145~~ 2143
↕ 500	+20			
↓ —2500—		-450 (7)	447	2663
↑ 430	+20			
↓ B	Bottom 3110 2930	-0	-3	3113

1600
1.83
4800
12800
1600
2928.00

3000 - 1844
3050 + - bk?
3100 @ 45
3200 - Stop -
3300 Stop - 0650
up to 3110 @ 1851
Start up - 1912 -

Lots of static in the water

Bottle 19 worked hard on release

Sta #17

Counting turns on winch drum

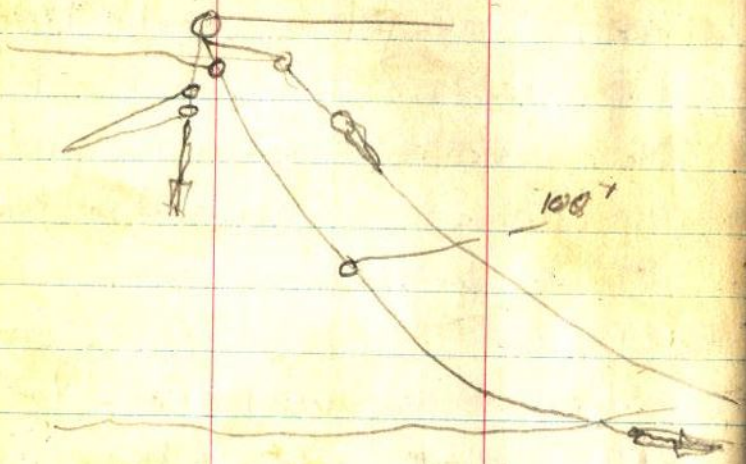
meter	count			
0	0	1200	680	3000 - 1744
50	26 (26½)	1300	—	3100 - 1810
75	39 (39½)	1400	756	3200 - 1874
100	52 (52¾)	1500	804	3300 - 1940
120	64 (63½)	1600		3365 try
130	69 (68½)	1700		202 - 107
149	74½ (78½)	1800	980	405 - 214¾
161	85 (85½)	1900	1046	508 - 270¼
200	107	(107¾) 2000	1105	611 - 326¼
300	158	2100	—	715 - 382¾
400	213	208, 218¾ 2200	1228	815 - 437¼
450	236			
500	309	2300	1300	1031 - 556½
600	319	2400	1360	450 - 240
700	372	(364) 2500	1420	1480 - 810
800	437	2600	1484	1700 - 937
900	480	2700	1545	2025 - 1128
1000	530	2800	1610	2345 - 1321¾
1100	—	2900	1676	2565 - 1345?
				3000 - 1522
				3500 - 1949

BT# 12059 (450-foot) Temporarily retired. Trace just very faint - there but faint, If need be, we can try to adjust this using the grid as a base - but I'd rather hold off as long as we can.

24 Feb '60

Station today went well - to 3113m with 3 casts & a core all in 2hrs & 37 minutes. These stations have finally become routine.

I decided today that since Dougall Reith told me that Blackburn asked him to try to discourage our using the spectrophotometer after Panama, since the phosphate data would be doubtful at the higher temps, since he has mineral water in his low-PO4 seawater, since the phosphates are at best a tricky operation,



Staff - Feb 25

Advance clocks 0330 to 0430 (+6)
Surveyor to be wired for 2
450-ft BT's with grids.

since poor data put out would reflect poorly on the Survey, since we will be pressed for time with stations every 100 (vs. 300 now) miles, and since Tuna needs it back by the first of May anyway, to have all phosphate equipment, return with Reith to La Jolla.

Last eve., BT# 11897 was put on

when ~~[illegible]~~ # 12059 gave a fainter & fainter trace.

26 Feb, 1960

The BT that replaced it was out of commission when I went topside yesterday morning. Having the BT winch out on the wing of the bridge is terribly hard on BT's. They bang the rubbing strake (?) as they go aft, & they swing like a crazy pendulum as

Stat #18

		Down	up	Line Depth
Srf		3590	3590	0
1000	+25			
1000		2565	2563	1027
200	+20			
1200		2345	2343	1247
300	+20			
1500		2025	2022	1568
300	+25			
1800		1700	1697	1893
200	+20			
2000		1480	1477	2113
1000	+30			
3000		450	446	3144
425	+25			
	3590		-4	3594

Btm 3422

165

10

3660 →

3860

3900

3950

Cast #1 wire 11°

Cast #2 " ∡20°

Cast #3 " ∡20°

3500 – 2207

3600 –

3700 – ✓

3800 –

3900 – 1010

3950

4000 — Step!!

4003 – @2211

Fall break

Srf	Srf	Srf
14	5A	3
16	25	2A
3	2B	19
2A	8	23B
19	23A	5B
23B	24	7
5B	13	cover
7		

1870 fms

1.83

5610

14960

1870

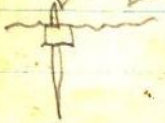
3422

Slow winch for last several hundred m., so free-fall mech. works better

Hauled up to 3590 – at it at Squid around line

Sta# 19 Cast #1 20°
Cast #2 45° - will steam - @08° 3° 0455
Steaming delayed? till vel. mtr. up.

		Power	up	wire length
s.f.		3905	3873	0
1000	+ 30			
1000		2875 - 2874	999	
200	+ 20			
1200		2655 - 2651	1222	
300	+ 20			
1500		2335 - 2333	1540	
300	+ 15			
1800		2020 - 2018	1855	
200	+ 20			
2000		1800 - 1797	2076	
1000	+ 25			
3000		775 - 771	3102	
725	+ 50			
Bottom		0 - 4	3877	



3725 m
2035 fms

counting
18 - 1900 - 59
19 - 2020 - 130
2335 - 320
2655 - 517
2875 -

3883 Ball @0604
up to 3873 @0604
Mess @ 0604
wire ∡ 0°
Steaming 20 trns.
Swell - 355° 2 ft
Seas 015° @ 1 ft
wind 9 mph 050°
glass powder

@20 mph on 095 ~~Bottle #7 needs tip wire guide lined up~~

They come in & even with all possible precautions do hit the side from time to time. This latter difficulty we have partly solved by putting a 50-ft line on a ring through which the BT cable runs out. As the BT starts in, the 50-ft are thrown over, the ring rides it down to the BT, and the 50 feet trail out behind it to act as a dampner. It works pretty well. Will send memo to the other ships with these high BT winches. What was broken on two of the BT's was only the stylus release mechanism, so I have them put the BT down with sleeve way aft & it works OK.

Radiod the Surveyor for two more 450-ft BT's.

Hi-speed net now going in every other tow, so that we will

have one to cover the dome area when we get there. 12-13 knots is just too fast for those nets & they tear badly - suggest "Not-so-hi-speed" as a better designation.

Station 18 last night was routine - as they have at last become! We got a wee sample of manganese crust, but no core. I heard a good ball break @ 4100 meters.

We should calibrate the sheave at Panama by laying out and measuring 100 m accurately & checking this vs. the counter.

I was afraid that with the counter on the big Markey winch being out of commish we would be in sorry shape (blue gone on my snappy 4-color pen, so I'll try another) if the Rimas

counter & head sheave Scripps learnt us went out. so I decided to have a pseudo-spare. Had chief Grant Lewis paint a mark on the rim of the winch drum and have had various people counting as the casts go down. It's something over 2000 turns to 3500 ft, and Alexander's eyeballs were going around like a roulette ball when he quit. I do think though, that this is a good safety factor.

Capt Jones, Cmdrs Bull & Stone all agree that the PDS equip should go back with Donyall Perth to Scripps.

Station #19 comes up at 0200, & it is now 2130, so I will get a few winks. It is over

Stoff Ntry – 24 Feb.
Night Order Bk.
Stoff – 28 Feb
Cable out to bottom –

90° in here but the ship is rolling so badly, air-scoops would only scoop in water, so I will just have to sweltter.

28 February, —

Wow – that's all – just wow. I dig get some sleep that night, but was up at 0230 for station #14 which started about 0340 the morning of the 27th. On the 2nd cast we tried "steaming on the wire" – that is, not lying to but keeping some way on so that the wire angle is less. The angle on Cast #2 was above 45°, and by steaming with the wind just off the port bow and making 20 turns, we can keep station pretty well. and the wire angle at messenger time was 0°. The wind was only 9 mph from 050°, so we were being set heavily to the west mainly by current. The ball

Sta #20

∡ = 10° 1st Cast

	Meter				Down	up
0 srf	~~30~~ (41)	srf		(430) ~~299~~	srf +20	3075
1 m	29	50	5A	355	500 +15	2555
5 m	25	75	25	330	800 +15	2240 ✓2239
10 m	20	100	2B	305	1000 +20	2025 ✓2024
12 m	18	150	8	250	1500 +15	1505 ✓1503
15	15	200	23A	200	2000	990 ✓ 988
20	10	300	24	100	2500 +10	475 473
25	5	400	13	0	Cover 0	2965 → -2
30	0					

1.83
12.8
~~3064~~ 3075
~~509~~ 520
825 836
1040 1051
1561 1572
2076 2087
2591 2602
3066 3080 3077

Ball @ 3151
at 1703

at 3075 - @ 1704
mud at 1708

3151
3075
76 m

3151
2965
186

1.83
17
1281
183
3141

1st
srf - 30 (41)
1 - 14 (29)
5 - 16 (25)
10 - 3 (20)
15 - 2A (18)
18 - 19 (15)
20 - 23B (10)
25 - 5B (5)
30 - 7 (0)

2nd
50 - 5A
75 - 25
100 - 2B
150 - 8
200 - 23A
300 - 24
400 - 13

3rd
500+
800+
1000+
1500
2000
2500

4"

~~3075~~
~~3151~~
~~241620~~
1.83
4860
12960
1620
296460
2965

went off at 3883m (Bottom depth 3725m) so by steaming ft only took 158m extra cable to get to the bottom – doing ft on station #20 ft took only 186m extra to ft bottom at 2965m – cores both times. The ball on stn #19 was just cakes of powder stuck to the bottom of the ball breaker when it came in. We were through by 0715 & I had a good breakfast & plotted BT profiles 'till afternoon and took off 3 hrs to run a bft.

I was due to meet with the Captain after the movie to work out our plan for the survey & station in the Thermal dome off Costa Rica (ca. 9°N, 89°W). I thought I'd wait 'till Ray Stone got his evening stars, and then we would know where to start computing running times & I lay down dressed on my bunk for a few minutes. I woke at 0230 and have

been here in the topside lab ever since, & it is now 2300! It has been quite a day!

Started having the BT's come every half hour at 0230 this morning, and we have taken some 35 since and I have ~~read~~ plotted them all on a running plot of thermal structure vs. distance. It was pretty interesting to watch: At 0500 the bottom of the mixed layer (top of the thermocline) was at 120ft. It rose to 80ft by 0600, 70ft at 0700, 65ft at 0800, 60ft at 0900 and 1000, 52ft at 1100, 50ft at noon, 36 feet at 1300, 40 feet at 1400, and the BT where we stopped on station 20, at 1500 had the bottom of the mixed layer at 27 feet. It was a pretty strong thermocline. The temperature dropped from 79° to 66° over a vertical distance of only 18 feet. Other ~~spots were~~ ~~even more~~ BT's showed even steeper

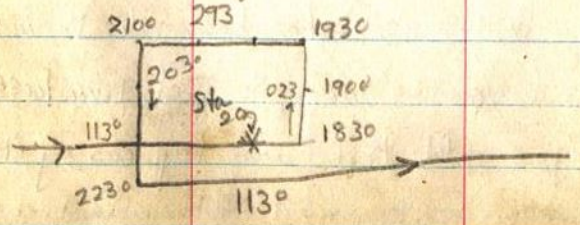
gradients.

Rather than use standard depths for the bottles, I put 2 in the mixed layer, one at the break, and 5 in the thermocline for a total of 8 bottles in the top 30m of water.

On the 2nd cast, we were steaming, & somehow the ship backed down for a second or so & the magnetometer on its cable ended up on the port side near the bottle cast wire, but then it disappeared. As the cast came in, the top bottle was down with the 2nd one - it had evidently slid down the cable till it was stopped by the bottle below it: when the next bottle broke the surface, I could for just an instant see the red magnetometer cable slip off the bottle and slide back into the water. We tried various ways to get them loose, & I finally suggested that we try easing the cable up with the next bottle. Paul eased in

the bottle
on the winch & did come in with the cable securely around it. We loosed it, made a big loop & pulled the cast up through the loop flipping the cable over each bottle.

In the midst of the deep cast, I knocked off to shave & put on my last pair of clean trousers for dinner with Capt. Jones in the Cabin along with the rest of the civilians. There are 10 of us: Reed, Slapsys, & Santiago, Hale, Ferreray, Nordahl, Berth, Raff, Shipek and me. The cast was in about 1800, and we took 2 more ½ hourly BTs on course & then started a box pattern over the thermal dome area. Now at quarter past midnight the top of the thermocline has started down again and is at



about 35 ft with the surface temperature back up to 80° vs. the 76 & 77° we got over the crest of the dome.

Now at 0030 on the morning of 29 Feb we are taking the last of these hourly BT's & will go back to our hourly schedule. This dome survey started actually at 1730 yesterday & we switched from hourly to ½ hourly observations when I came up at 0230.

One BT hitch this evening, when too much slack got into the cable and it jumped the sheave and jammed solidly. Had to stop the ship & swing in the boom & fix it up. Other than that the BT has worked well.

Now we are on toward station #21, our last prior to Panama!

1 March- 2000-

Left a call for 0230 & we were on station #21 at 0320. and we got away by 0615. This station we shudda skipped! Our making or not making #21 was determined by the currents. Usually it is the stations that determine the oceanographic regime. This trip it was just the reverse. With a good current we would be enough ahead of our ETA to make it; with opposing current, we might have to pass it by in order to get to the canal in time to get in without having to wait outside all night. We were running

ahead by the time I quit, so we made station #21.

This steaming on the wire to keep the wire angle down has worked well for us - 'till now! This morning we fell off the wind and over the cable just as the deep cast got down. The messenger was dropped but held up where the cable passed over the rubbing strake as it ran beneath the hull. With the magnetometer out, it was 20 minutes before it was manhandled in, the ship was swung, and the messenger slipped on down. There was a fair ball-break - so we got another core (9 out of 10 trys

so far), but the messenger on the 1800 m bottle failed to release, so the bottles at 2000 and 3000 m never tripped - with a few loose a few, I guess. Other than that it went well.

It seems strange that what started out as only an idea over a year ago, blossomed through the planning stage, through volumes of correspondence, through the sweat of getting financial backing for it, publicity for it, equipment for it, people for it, - and now it is nearly half over, at least in miles steamed. There is still the major portion of the work to be done, but this evening we

reached our southernmost point, & from here on in we will be running north-ish. It has been a thoroughly good trip so far, & I think all aboard feel it has been worthwhile — with the possible exception of the firemen. It was 140° down there this afternoon. Matthews who used to be on the Mariner looked as though he had just stepped out of a shower.

Some of the crew have what must be pretty sore sunburns, and we are on for a lot more before we get home.

We pulled in the final net tow this afternoon at 1550 & the magnetometer was hoisted

aboard shortly after 1600. We knocked off the BT's as we crossed the 100 fm line, and stopped throwing drift bottles at 2200 tonight off Point Mala. Slapsys, Reed, & Santiago who have been on a regular watch schedule of 4 on and 8 off ~~are~~ are up in the plotting room ~~getting~~ preparing tabulations of thermometer corrections and copying acco. station data sheets for Scripps, so they can work up the material to go with the phosphate and nitrite analyses.

At 0600 tomorrow after we have advanced our clocks to +5 time zone - we will be at the Balboa sea buoy & I

have left a 0515 call, so I can help Chief Mike Uporski with the 2 cores for the Public Health Service.

Plan in Panama to round up a swimming pool & get Byron Hole, Cmdr. Ball, and the ensigns (Moses, Connell, Allen, and Hess) checked out in the aqua-lung.

Plan also to reel off 100 meter of cable along the dock & to check the calibration of the Rimco remote counter that Snodgrass at Scripps let us borrow. We have used it, & it has worked well so far.

Plan also to write Mrs. S. and to wrap myself around a tall cool beer.

As I read this over, it all sounds as though everything has gone wrong. This is a highly erroneous impression resulting from a high degree of selectivity in those things I choose to mention. Actually, things have gone very smoothly & it is the occasional misfires that I have dwelt on - perhaps overly - in hopes that by pointing these things up they will not be repeated. When all goes well, it is really hardly worth mentioning.

All aboard have cooperated to the utmost to pull this thing off. I can't praise Capt Jones and all aboard enough. It is a good outfit, & I am glad to be aboard.

To Do

1) ~~get reimbursed for beach ball netting~~ $10.00
2) ~~switch bucket thermoms~~
3) Keep BT plot up to date
4) ~~Allen wrench~~ & ball bkrs to Mike
5) ~~Start depth break wire & table~~
6) ~~Lable core & complete sta data on depth~~ #13
7) Check local time meridian on records. There will be 3 changes.
8) ~~New bottle rocks in lab, or department~~
9) ~~Balls down on next cast~~ yes, 4
10) ~~Ocea. helper how busy during day?~~
11) Swan Island plan
12) ~~Winch time card for SD~~ start - Dn. Mess-up-in
13) ~~Fill O_2 fixing bottles~~
14) ~~Man to assist capstan man on net tows.~~
15) ~~Label Ex 14 core~~
16) ~~Get pin made for ball bkr, & put in new countersink.~~
17) ~~Get sat temp on BT's from SD to Sta 15~~
18) ~~Adjust drift bottles~~
19) ~~Put 14 on top, so we can see if it trips.~~
20) Swan Is. Plan. - fix Sta #16 core
21) Sta Summary 22) Plot winch turns.
22) Drift bottles left & needed??
23) ~~0530 Core Sta - 3 bbls~~
24) Send book off to KGC - BT form 732's from KGC ~~write Routine & fin~~
25) Summary sheet of stations
26) Panama Rpt through Capt.
27) Drift sheets to Crosby -
28) ~~Core data sheets up to date~~
29) ~~Check H-sheet comps for L depth~~
30) ~~30 to send from~~ 732's

AT Washington -

1) Strongly recommend BT winch be moved back to the fantail.

2) Present nansen bottle racks on Ex in the lab are very poor.

3) Nansen bottles should number at least 18 for one complete set - with this should be at least 24 protected and 18 unprotected. Actually a double set should be aboard each ship

4) Shipek, Wyatt, Nordahl, Raff, Reith to get photos

5) Ship needs more AC power - whatever happened to AC generator to have been put aboard at Seattle? - Bryant had said it would be aboard?

6) Space requirements in wheelhouse & on board for oceanog. equip coming aboard and power req. for future ships Ex. didn't know how much space should be allotted. Personnel too!

7) Do winch report to SIO

8) Orders should be written to report to Ship Efficer to assist - assigned for

At Panama—

1) Get Bradshaw's 1ire foream sample and send airmail special
2) ~~Get list from Dougall of all gear left aboard~~
3) 25 cases to Wm, Bayliff, IATTC Univ. of Panama Panama 3-7320 Cases left by Cliff Paterson & Barrett
4) Collect 1 ml. pipette - 2 on ff. Dougal
5) Write about smooth plotting to be done soon!
6) Check compressor & fuel tanks—
7) Magnetic anomaly letter to Menard
8) Measure off 100 m on dock & tape it then check on next cast. - Big winch.
9) Get (?) burette, 1ml pipette
10) Copy BT sheets for Dougall. ✓
11) Distilled H_2O - Keith's 1 ml pipette?
12) Check H sheets & copy for SIO
13) Beakers or Erlenmyer flasks—
14) How many drift bottles left?
15) wax for drift bottles
16) film off
17) Stamps from 30?
18) Envelopes - 200 at least
19) Rubber stamp?

At Key West

1) ~~Return all of Reith's gear to Scripps as they must be back there by 1 May~~
~~Send message that it is en route~~

At Norfolk

1) Return 3 sheaves, counter, extra selsin, plate, bolts, extension cord, 2 ball blks, extra points, and left over balls to Snodgrass.
2) Winch report to SIO
3) Marker pen – for bottles, etc.
   Tech-pen
   Mark-Tex Corp.
   153 W 14th St., N.Y. 11, NYC.
4) Smooth plot to be done as soon as possible.
5) Dummy Manual Back
6) Depressor & Smpls to Bluehaven