D27

SAMPLE DESCRIPTION

Cruise Id: L5-83-HW Size: 28 x 33 x 36 m Location: S.P. Lee Guyot

Sample Id: D27 Weight: 14 Kg Depth: 1150-1125

Mn Crust Description

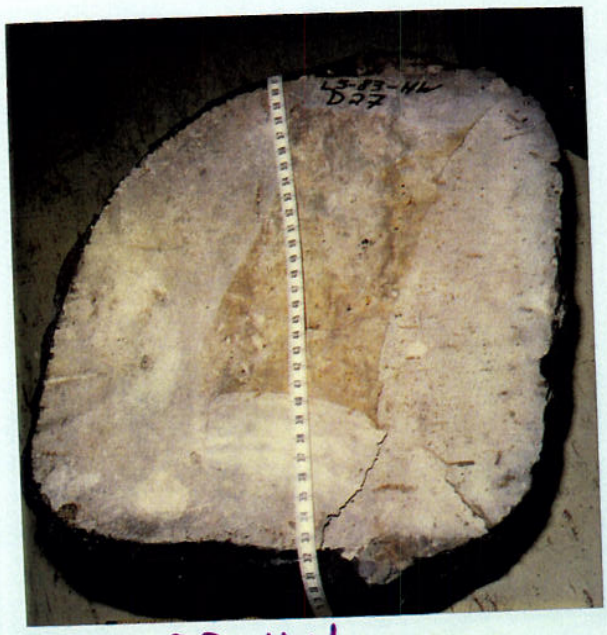
Surface Texture: Smooth bathy [illegible]

Mn Crust Thickness:

Min: 3mm Max: 10 mm Ave: 5 mm

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.				
2.				
3.				
4.				
5.				
6.				



L5-83-HW
D27

ments and XRD Mineralogy:

Substrate Description

Rock Type: Limestone Boulder: finish bioclastic lime with breccia cemented to outer edges in small patches

Description:

[illegible]

ANALYSES

Subsample & Type	Analysis	Weight

Described By: J. Schulz Subsampled By:

Sample Description D27-A1-1 and

Cruise I.D: L5-83-HW

Sample I.D: Sta: D27-A1-2

Location:

Size: [illegible] Weight:

Depth 1150-1125

Mn crust thickness:

Total: min: max: ave:

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: botryoidal-[illegible]

Internal structure:

layered:
laminated:
massive: ✓
porous:
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

[illegible]

Substratum:

Rock type: volc. breccia

Description: thin Mn crust on one side green to orange [illegible] coarse sandstone matrix with subrounded clasts of [illegible] Poorly sorted pebbles to [illegible] cement is calcareous (reacts to HCl) Clasts are generally basalt altered to fresh, a few mineral grains are observable

[illegible]

several pieces have spheroidal mineral (?) between grains - cream to [illegible] XRD or [illegible]

Mineralogy (XRD):

D27-A1-1 and A1-2

Analyses and subsamples:

analysis:	analyst:
Subsampled Porous	[illegible]
XRD of spheroidal [illegible] mineral	27-A1-1

SAMPLE DESCRIPTION

May 1998: 10x15x10-cm [illegible] pc [illegible]

Cruise Id: L5-83-HW Size: 35x19x9 cm Location: S.P. Lee Guyot

Sample Id: D27-B1 Weight: 2 kg Depth: 1150-1125 m

Mn Crust Description

Surface Texture: Flattened [illegible]

Texture through the crust is dense [illegible]

a few phosphate infilling of [illegible]

Mn Crust Thickness:

Min: 15mm Max: 30mm Ave: 20mm

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.				
2.				
3.				
4.				
5.				
6.				

L5-83-HW
D27-B1

Comments and XRD Mineralogy:

One area of crust on the side of sample has antipatite layer up to 1.5cm thick

ANALYSES

Subsample & Type	Analysis	Weight
new crust	CC (Reston)	Job # BZ87 6/88
I 0-5 mm	"	4 gm [illegible]
II 5-11 "	"	5 " [illegible]
III 11-17 "	"	7 " [illegible]
IV 17-23 "	"	4 "

Sent a pc to Alex Halliday in Michigan 6 May 98

Substrate Description

Rock Type: [illegible] to micritic

Description:

Described By: Jung-Keuk Kang 6/88 Jung-Keuk Kang 6/88

Sample Description

Cruise I.D: L5-83-HW

Sample I.D: Sta: 45 D 27-B1-2 Location: S.P. Lee Seam

D = 1150 - 1125

Size: 30x20x3 cm Weight: ~ 8 kg

Mn crust thickness:

Total: min: 0.3 cm max: 1.5 cm ave: 0.8 cm

Inner crust: min: — max: — ave: —

Outer crust: min: — max: — ave: —

Surface texture: botryoidal

Internal structure:

layered: ✓
laminated:
massive: ✓
porous:
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:
iron oxides / hydroxides

Substratum: Ironstone

Rock type: altered volcanic (?) Rock; Replaced by iron (probably)

Description: Rock is very dense, has a "look" of chert but is too dense for more chert

Phosphorite, cream colored between crust and substrate in small areas. The crust (especially on the bottom of the sample) has a brown color. Fragments + phosphate?, chert? + phosphate cement w/ [illegible] forms, replaced w/ quartz? + other [illegible]

Mineralogy (XRD):

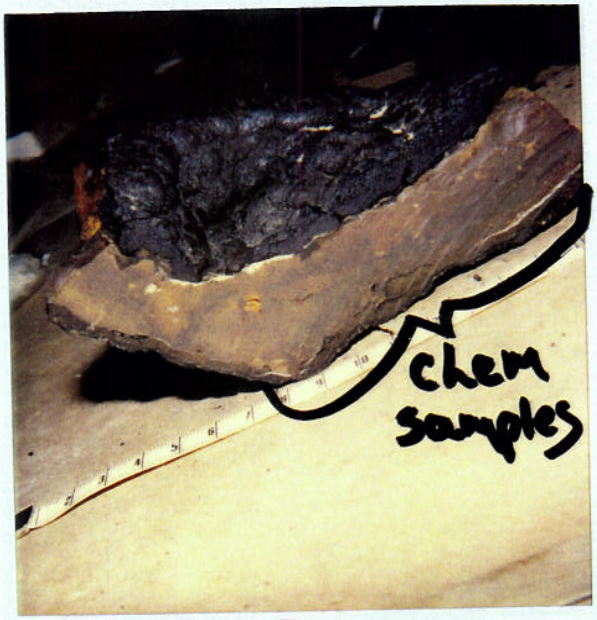
Probably goethite

White: Apatite

D27-B1-2
L5-83-HW

Analyses and subsamples:

analysis:	analyst:
organic matter	Bill Orem 3/27/[illegible]
D27-B1-2 substrate - 40 element ADC 59 gram	
DPTS as indicated on back	
Archived small piece of the [illegible]	
B1-2 (Ironstone) sampled for	CC, Pt-group, XRD
(05/01/90)	REE, Sr+Os [illegible]
CC, Pt, Au (46.8g)	+ 35 MM
REE (11.0g)	
B1-2b (white frag.s)	= Apatite



← CC, RE[illegible] XRD, Pt group, Sr isotopes, O_2 isotopes

D27-B1-2

L5-83-HW

← 4D element + CC

L5-83-HW

D27-B1-2

page 3

Sample Description

Cruise I.D: L5-83-HW

Sample I.D: Sta: D27-B2

Location: S.P. Lee

Size: 52x42x22cm Weight: 41 Kg

* cut in 6 pieces

Mn crust thickness:

Total: min: 1.5cm max: 5cm ave: 4cm

Inner crust: min: max: ave: 3cm

Outer crust: min: max: ave: 1cm

Surface texture: Botryoidal (small) & smooth

Internal structure:

layered: ✓ ~3

laminated: ✓

massive:

porous:

dendritic:

other:

D27-B2 L5-83-HW

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

phosphorite layers in crust

Substratum:

Rock type:

Description: Mostly-replaced carbonate (and Mn) mud with vugs that have Mn "crust" and are then filled w/ phosphorite. Contains intergrowths (cobble sized) of semi-replaced carbonate matrix volcaniclastic breccia. Clasts are mostly basalt, matrix supported, + well rounded. Also phosphorite? clasts; one generation of angular, brown elongate clasts, and another of white round probably pore fillings.

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
35mm slide	G. Smith

Phosphate study

Sample Description

Cruise I.D: L5-83-HW

Sample I.D: Sta: D27-B2

Location: S.P. Lee

Size: Weight: 41 Kg

Mn crust thickness:

Hydrothermal deposits:

Analyses and subsamples:

analysis:

analyst:

35mm slide

Substratum:

Rock type:

Description:

Mineralogy (XRD):

page 3 of

SAMPLE DESCRIPTION

Cruise Id: ~~P7-87-SC~~ LS-83-HW Size: _____ Location: S. P. Lee Guyot

Sample Id: D27-B2 Weight: _____ Depth: _____

Mn Crust Description

Surface Texture: _____

Is this from D27-B2?

Mn Crust Thickness:

Min: _____ Max: _____ Ave: _____

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.				
2.				
3.				
4.				
5.				
6.				

Comments and XRD Mineralogy:

Substrate Description

Rock Type: _____

Description:

ANALYSES

Subsample & Type	Analysis	Weight
Mn crust	CC (Preston)	Job # BZ89 6/88
I 0-5 mm	"	6 gm
II 5-12 "	"	9 "
III 12-20 "	"	9 "
IV 20-30 "	"	8 "
Mn crust	REE (Denver)	Job # SW32
I 0-5 mm	"	
II 5-11 mm	"	
III 11-17 "	"	
IV 17-23 "	"	

Described By: Jung-Keuk Kang 6/88 Subsampled By: Jung-Keuk Kang 6/88

Sample Description

Cruise I.D: L5-83-HW

Sample I.D: Sta: D 27-B3

Location: S.P. Lee

Size: 50x40x20 cm Weight: _____

Mn crust thickness:

Total: min: _____ max: _____ ave: _____

Inner crust: min: _____ max: _____ ave: _____

Outer crust: min: _____ max: _____ ave: _____

Missing

Surface texture: _____

Internal structure: _____

layered: _____
laminated: _____
massive: _____
porous: _____
dendritic: _____
other: _____

Mineralogy (XRD): _____

Associated alteration, phosphorite, or hydrothermal deposits: _____

Substratum:

Rock type: _____

Description: _____

Mineralogy (XRD): _____

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: L5-83-HW

Sample I.D: Sta: 45 D 27-B5-1

Location: S.P. Lee Seam

Size: 23x14x11 Weight: 3.9 kg

Mn crust thickness:

Total: min: 6mm max: [illegible] ave: 1cm

Inner crust: min: [illegible] max: [illegible] ave: [illegible]

Outer crust: min: [illegible] max: [illegible] ave: 6mm

Surface texture: Smooth - abraded

Internal structure:

layered: ✓ 3

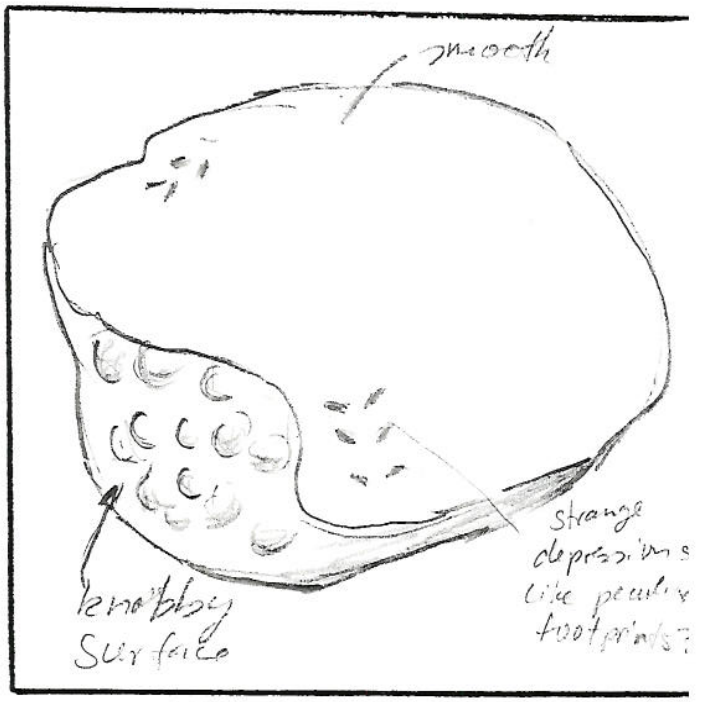
laminated:

massive:

porous:

dendritic:

other:



Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: breccia

Description: [illegible] brownish orange subrounded ironstone clasts w/ cream colored phosphorite & volcanic clasts

Mineralogy (XRD):

Goethite Major

Apatite Moderate

Analyses and subsamples:

analysis:	analyst:
	Janet Haggerty
D27-B5-1, XRD substrate	
9.0gm, O_2 isotopes	Yeh

LS-83-HW

D27-B5-1

Sample Description

Cruise I.D: L5-83-HW

Sample I.D: Sta: 45 D 27-B5-2 Location: S.P. Lee S

Size: 18x11x 5 cm Weight: 2.6 kg

Mn crust thickness:

Total: min: 5 mm max: 12 mm ave: 7 mm

Inner crust: min: 4 mm max: 6 mm ave: 5 mm

Outer crust: min: 5 mm max: 7 mm ave: 6 mm

Surface texture: 5moo [illegible]

Internal structure:

layered: 2

laminated:

massive: ✓

porous:

dendritic:

other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Ironstone, Replacing lms?

Description: Mn nodule w/ ironstone and phosphorite nucleus

Mineralogy (XRD):

XRD shows 100% Goethite

L5-83-HW

45-D27-B5-2

Analyses and subsamples:

analysis:	analyst:
	Janet Hagerty
D27-B5-2 (ironstone)	CC, XRD
D27-B5-2 (IRONSTONE) (05/01/90)	C.C, Pt, Au (20.3g) REE (7.6g)

Sample Description

Cruise I.D: L5-83-HW

Sample I.D: Sta: 45 D 27-35-3

Location: S. P. Lee Sm

Size: 16x11x6 Weight: 2.9 kg

Mn crust thickness:

Total: min: 1mm max: [illegible] ave: [illegible]

Inner crust: min: [illegible] max: [illegible] ave: [illegible]

Outer crust: min: [illegible] max: [illegible] ave: [illegible]

Surface texture: [illegible]

Internal structure:

layered: ✓ 1-3

laminated:

massive:

porous:

dendritic:

other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Phosphorite

Description: [illegible] (reduced from sand)

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
[illegible]	[illegible]
Chemistry: of bulk sample, from back of sample	
- Pt group	Floyd Johnson - Poston
- Au anal	Dave McKown - Dam

L5-83-HW

45-D27-B5-3

Sample Description

Cruise I.D: L5-83-HW

Sample I.D: Sta: 45 D 27-B5-4

Location: S.P. Lee S

Size: 14x3x6 cm Weight: 3.4 kg

Mn crust thickness:

Total: min: 7mm max: 3.0cm ave: 1cm

Inner crust: min: 3mm max: 5mm ave: 3mm

Outer crust: min: 4mm max: 2.0cm ave: 7mm

Surface texture: smooth-abrasion

Internal structure:

layered: ✓ 2

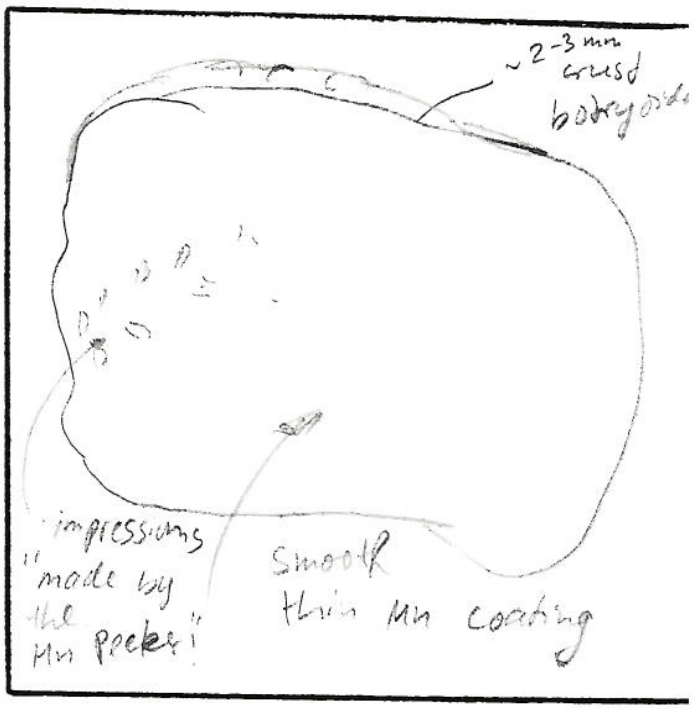
laminated:

massive: ✓

porous: ✓

dendritic:

other:



Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: [illegible] w/ Mn cement

Description: [illegible] phosphorite or worm tubes in outer [illegible] of crust/clasts of brownish orange ironstone & white phosphorite [illegible] → [illegible] matrix is Mn

Mineralogy (XRD):

Goethite (Major) + Apatite (Moderate)

Analyses and subsamples:

analysis:	analyst:
	Janet Haggerty
D27-B5-4	XRD

L5-83-HW

45- D27-B5-4

Sample Description

Cruise I.D: L5-83-HW

Sample I.D: Sta: 45 D 27-B5-5 Location: S P. Lee Sm

Size: 18x12x5 cm Weight: 2.3 kg

Mn crust thickness:

Total: min: 20mm max: 43mm ave: 30mm

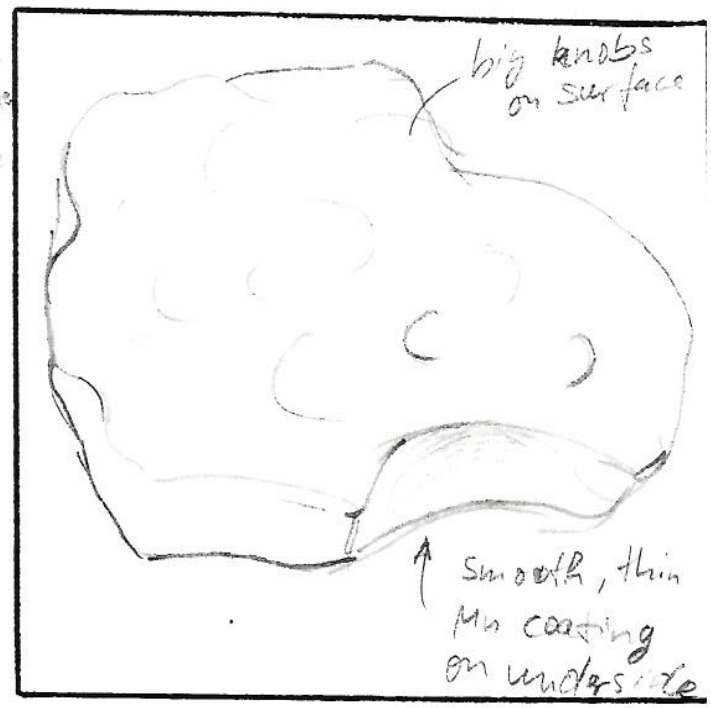
Inner crust: min: 10mm max: 16mm ave: 12mm porous phosphorite

Outer crust: min: 4mm max: 19mm ave: 17 massive

Surface texture: large scale botryoidal

Internal structure:

layered: ✓ 2
laminated: ✓
massive: ✓
porous: ✓
dendritic:
other:



Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:
some phosphorite with bottom layer

Substratum:

Rock type: limestone

Description: lithified foram sand

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
	Janet Hagerty

L5-83-HW

D27-B5-5

SAMPLE DESCRIPTION

ise Id: L5-83-HW Size: 14.5×11.5×7cm Location: S.P. Le Guyot

Sample Id: D27-B5-6 Weight: 1.5 Kg Depth: 1125m - 1150m

Mn Crust Description

Surface Texture: smooth

Mn Crust Thickness:

Min: 2 mm Max: 22mm Ave:

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.	2m	22mm	14mm	black, massive
2.				
3.				
4.				
5.				
6.				

ments and XRD Mineralogy:

Substrate Description

Rock Type: limestone

Description:

lithified foram sand

ANAL

Subsample & Type	Analysis	Weight

Described By:

Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: L5-83-HW Size: 14x10.5x6 cm Location: S.P. Lee Guyot

Sample Id: D27-B5-7 Weight: 0.8 kg Depth: 1125-1150m

Mn Crust Description

Surface Texture: smoothed botryoidal (most of the outer crust is missing)

Mn Crust Thickness:

Min: 2mm Max: 10mm Ave: 3mm

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.	3mm	9mm	7mm	black massive
2.	1mm	4mm	2mm	black, very porous, pores filled w/ phosphorite
3.				
4.				
5.				
6.				

ments and XRD Mineralogy:

ANALYS

Subsample & Type	Analysis	Weight

Substrate Description

Rock Type: volcaniclastic breccia

Description:

fairly fresh, rounded basalt? clasts. some angular glass. pebble sized clasts. phosphorite cement. Matrix supported

Described By:

Subsampled By:

SAMPLE DESCRIPTION

ise Id: L5-83-HW Size: 6 cobbles, biggest = 6.5×7×5cm Location: S.P. Lee Guyot

Sample Id: D27-B5-8 Weight: 1.1 Kg Depth: 1125-1150m

Mn Crust Description

Surface Texture: Smooth + smoothed botryoidal

Mostly broken off, texture [illegible] by sample

Mn Crust Thickness:

Min: _____ Max: 24mm Ave: _____

Layers (Outer to Inner): one hand sample

	Min	Max	Ave	Texture
1.	6mm	9mm	7mm	block massive
2.	3mm	3mm	3mm	"
3.	2mm	2mm	2mm	"
4.	2mm	2mm	2mm	"
5.				
6.				

listed inner to outer

ments and XRD Mineralogy:

Replaced teeth

Substrate Description

Rock Type: Carbonate with detrital lithic fragments.

Description:

Subrounded pebble sized volcanic clasts. Poorly sorted. Matrix supported.

Varying degrees of phosphorization, some very complete.

Replaced teeth

ANALYSES

Subsample & Type	Analysis	Weight

Described By:

Subsampled By:

Sample Description

Cruise I.D: L5-83-HW Sample I.D: Sta: D27-B5-9 Location: S.P. Lee Guyot

Size: 23x21x8 cm Weight: 1 kg

Mn crust thickness:

Total: min: 2mm max: 5mm ave: 4mm

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: botryoidal w/ [illegible]

Internal structure:

layered:
laminated:
massive:
porous:
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Volcaniclastic Breccia

Description: Fairly fresh subrounded basalt clasts w/ minor glass fragments poorly sorted w/ larger grains concentrated in layers/beds matrix is carbonate and phosphorite(?)

Mineralogy (XRD):

D27-B5-9
L5-83-HW

Analyses and subsamples:

analysis:	analyst:
XRD	C. Daniel
2 substrate	
Chemistry bulk substrate	
Density	

SAMPLE DESCRIPTION

ise Id: L5-83-HW Size: 9.5 x 7.5 x [illegible] Location: S.P. Lee Gravel

Sample Id: D27-B5-10 Weight: < 1 kg Depth:

Mn Crust Description

Surface Texture: smooth,

Mn Crust Thickness:

Min: 1mm Max: 20 mm Ave: 10 m

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.				
2.				
3.				
4.				
5.				
6.				

D27-B5-10
L5-83-HW

ments and XRD Mineralogy:

layers are apparent but not continuous around the sample. The sides of sample has [illegible] permeated into the sample.

Substrate Description

Rock Type: Breccia cemented w/ phosphorite and carbonate.

Description:

Breccia w/ ironstone cobbles (like D27-B1-2) basalt cobbles & limestone cobbles

XRD shows Goethite & Apatite

ANALYSES

Subsample & Type	Analysis	Weight
D27-B5-10	XRD	

Described By: J. Schulz Subsampled By:

SAMPLE DESCRIPTION

ise Id: L5-83-HW Size: _____ Location: S.P Lee Gygot

Sample Id: D27-B5-11 Weight: _____ Depth: _____

Mn Crust Description

Surface Texture: Botryoidal

Mn Crust Thickness:

Min: ? Max: 10 mm Ave: ?

most of the [illegible]

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.				
2.				
3.				
4.				
5.				
6.				

L5-83-HW

D27-B5-11

ments and XRD Mineralogy:

Substrate Description

Rock Type: Volcaniclastic Breccia

Description:

Same Stuff as D27-B5-9

Crust has broken off the top of the sample.

ANALYSES

Subsample & Type	Analysis	Weight

Described By: J. Schulz Subsampled By:

SAMPLE DESCRIPTION

ise Id: L5-83-HW Size: 8x7x3.5 cm Location: S.P Lee Guyot

Sample Id: D27-B5-12 Weight: [illegible] Depth:

Mn Crust Description

Surface Texture: smooth botryoidal

Mn Crust Thickness:

Min: 3mm Max: 7mm Ave: 4mm

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.				
2.				
3.				
4.				
5.				
6.				

D27-B5-12
L5-83-HW

ments and XRD Mineralogy:

Substrate Description

Rock Type: Carbonate w/ [illegible] white fragments

Description:

Mn staining [illegible] [illegible]

Described By: J. [illegible] Subsampled By:

ANALYSES

Subsample & Type	Analysis	Weight

SAMPLE DESCRIPTION

ise Id: L5-83-HW Size: 9 x 4.5 x 7.5 cm Location: S.P. Lee Guyot

ample Id: D27-B5-13 Weight: <1 kg Depth: 1150-1125 m

Mn Crust Description

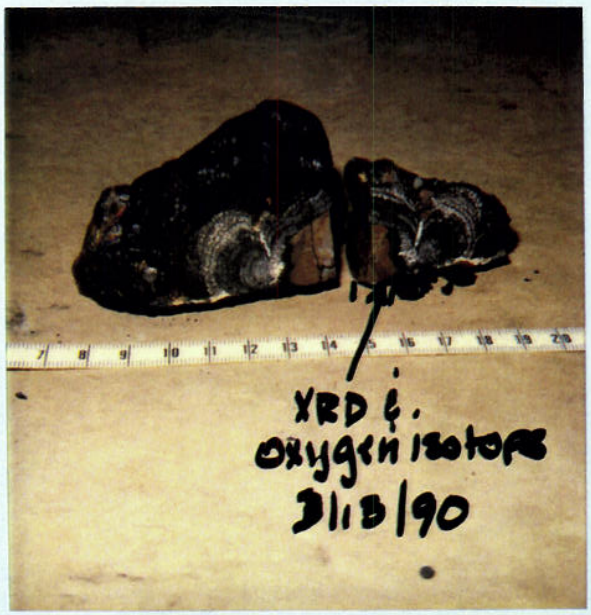
Surface Texture: botryoidal

Mn Crust Thickness:

Min:_____ Max:_____ Ave:_____

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.				
2.				
3.				
4.				
5.				
6.				



L5-83-HW

D27-B5-13

ments and XRD Mineralogy:

Substrate Description

Rock Type: Basalt and Ironstone clasts

Description:

This piece is part of a larger nodule

Note the phosphate [illegible]

XRD shows Goethite + Apatite

ANALYSES

Subsample & Type	Analysis	Weight
D27-B5-13 (substrate)	XRD	
D27-B5-13	Oxygen isotope	[illegible]
D27-B5-13	XRD	0.50gm [illegible]

Described By: J. Schulz Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: L5-83-HW Size: 18 x 9 x 2.5 cm Location: S.P. Lee Guyot

Sample Id: D27-B5-14 Weight: [illegible] Depth:

Mn Crust Description

Surface Texture: Top: [illegible] smooth/undulating

Bottom: [illegible]

Mn Crust Thickness:

Top: Min: [illegible] Max: 8 mm Ave: [illegible]

Bottom: [illegible]

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.				
2.				
3.				
4.				
5.				
6.				

L5-83-HW
D27-B5-14

Comments and XRD Mineralogy:

ANALYSES

Subsample & Type	Analysis	Weight

Substrate Description

Rock Type: Limestone w/ lithic clasts

Description:

Described By: J. Schmidt Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: L5-83-HW Size: 13x29x29 cm Location: S.P Lee Guyot

Sample Id: D27-B5-15 Weight: 75 kg Depth: 1150-1125

Mn Crust Description

Surface Texture: Smoothed botryoidal

Mn Crust Thickness:

Min: 2mm (broken) Max: 30mm Ave: 10mm

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.				
2.				
3.				
4.				
5.				
6.				

D27-B5-15
L5-83-HW

ments and XRD Mineralogy:

Crust wraps into hollows between highs of the lms; inner layers have a lamination to them.

Substrate Description

Rock Type: Limestone

Description:

Lithified [illegible] looks to be clam mold [illegible] a white [illegible] Mn covered [illegible] side [illegible] etc. [illegible] layers of [illegible]

ANALYSES

Subsample & Type	Analysis	Weight

Described By: J Schulz Subsampled By: