



**BETA ANALYTIC INC.**

DR. M.A. TAMERS and MR. D.G. HOOD

UNIVERSITY BRANCH  
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## REPORT OF RADIOCARBON DATING ANALYSES

Dr. Eugene Schweig  
University of Memphis

August 26, 1998

October 5, 1998

Sample Data	Measured C14 Age	C13/C12 Ratio	Conventional C14 Age (*)
Beta-121569	1120 +/- 50 BP	-25.5 o/oo	1110 +/- 50 BP
SAMPLE #: V/T3/D/3/CP ANALYSIS: Standard-AMS MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid			
Beta-121572	390 +/- 50 BP	-24.8 o/oo	390 +/- 50 BP
SAMPLE #: V/T2/D/1/CP ANALYSIS: Standard-AMS MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid			
Beta-121573	1060 +/- 50 BP	-24.7 o/oo	1070 +/- 50 BP
SAMPLE #: V/T1/D/E4/CP ANALYSIS: Standard-AMS MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid			
Beta-121574	1090 +/- 50 BP	-21.5 o/oo	1150 +/- 50 BP
SAMPLE #: V/T1/D/E/CP ANALYSIS: Standard-AMS MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid			
Beta-121575	1100 +/- 50 BP	-25.4 o/oo	1090 +/- 50 BP
SAMPLE #: V/T1/D/W/CP ANALYSIS: Standard-AMS MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid			

NOTE: It is important to read the calendar calibration information and to use the calendar calibrated results (reported separately) when interpreting these results in AD/BC terms.

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (\*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

v/T3/D/3/CP

# CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.5:lab mult.=1)

Laboratory Number: Beta-121569

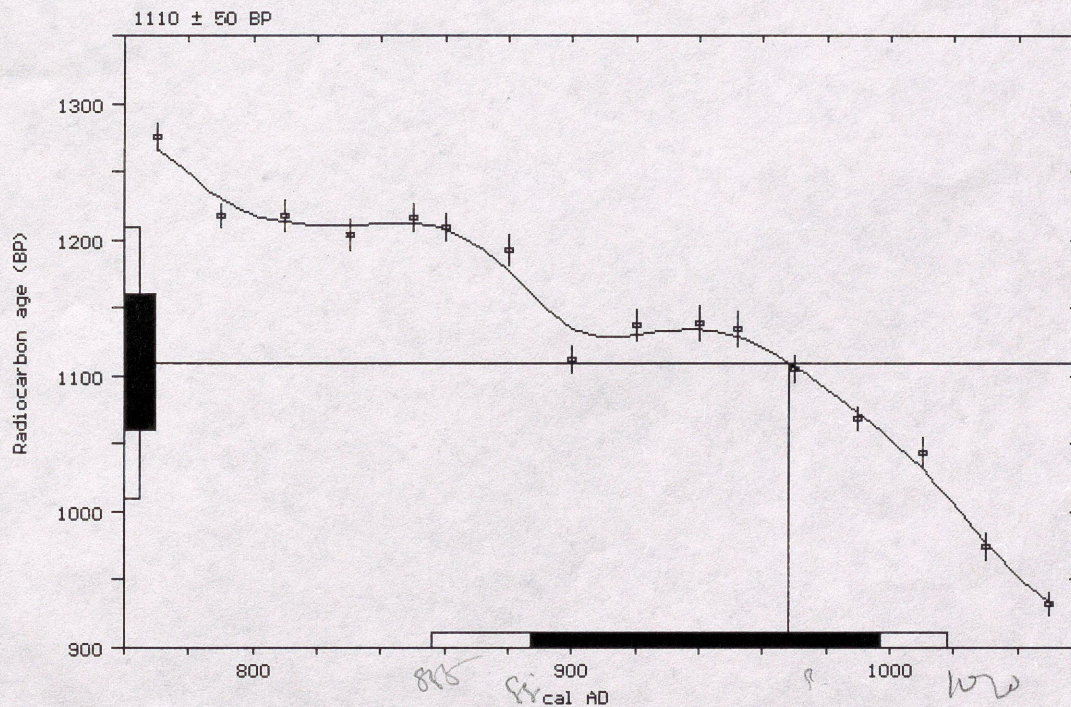
Conventional radiocarbon age: **1110 ± 50 BP**

**Calibrated results:** cal AD 855 to 1020  
(2 sigma, 95% probability)

Intercept data:

Intercept of radiocarbon age  
with calibration curve: cal AD 970

1 sigma calibrated results:  
(68% probability) cal AD 885 to 995



References:

*Pretoria Calibration Curve for Short Lived Samples*

Vogel, J. C., Fuls, A., Visser, E. and Becker, B., 1993, *Radiocarbon* 35(1), p73-86

*A Simplified Approach to Calibrating C14 Dates*

Talma, A. S. and Vogel, J. C., 1993, *Radiocarbon* 35(2), p317-322

*Calibration - 1993*

Stuiver, M., Long, A., Kra, R. S. and Devine, J. M., 1993, *Radiocarbon* 35(1)

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N/T2/D/1/CP

# CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.8:lab mult.=1)

Laboratory Number: Beta-121572

Conventional radiocarbon age: **390 ± 50 BP**

**Calibrated results:** cal AD 1430 to 1645  
(2 sigma, 95% probability)

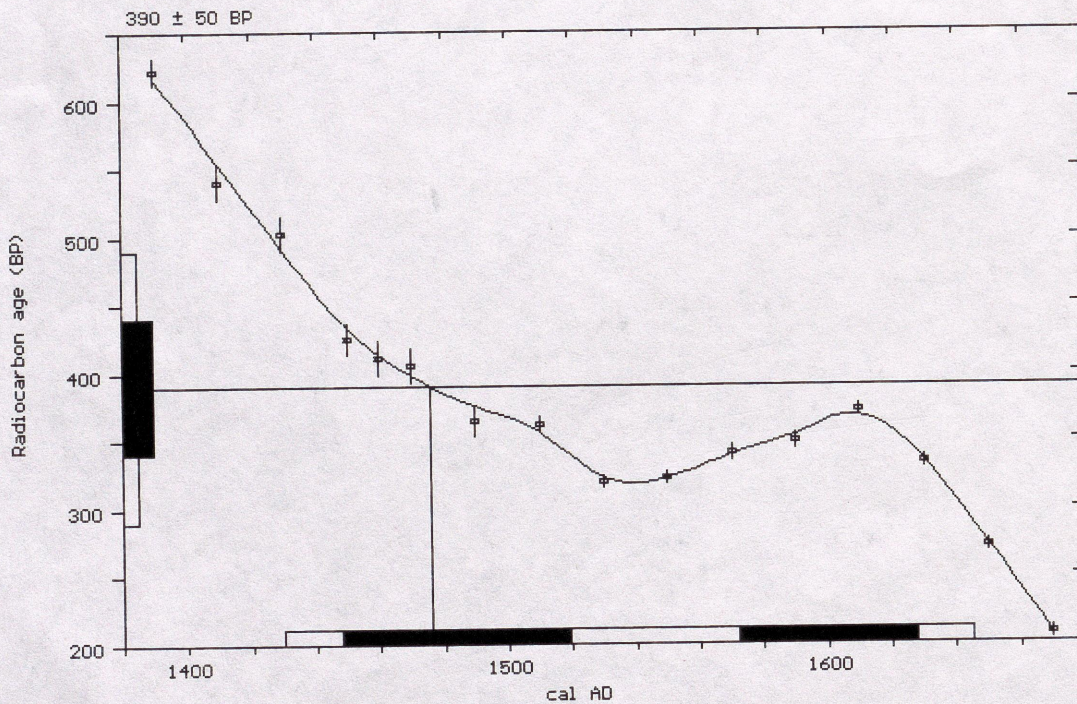
Intercept data:

Intercept of radiocarbon age with calibration curve: cal AD 1475

1 sigma calibrated results: cal AD 1450 to 1520 and cal AD 1570 to 1630

390 ± 50  
440

1520-1610



References:

*Pretoria Calibration Curve for Short Lived Samples*  
 Vogel, J. C., Fuls, A., Visser, E. and Becker, B., 1993, *Radiocarbon* 35(1), p73-86

*A Simplified Approach to Calibrating C14 Dates*  
 Talma, A. S. and Vogel, J. C., 1993, *Radiocarbon* 35(2), p317-322

*Calibration - 1993*  
 Stuiver, M., Long, A., Kra, R. S. and Devine, J. M., 1993, *Radiocarbon* 35(1)

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V/T1/D/E4/CP

## CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.7:lab mult.=1)

Laboratory Number: Beta-121573

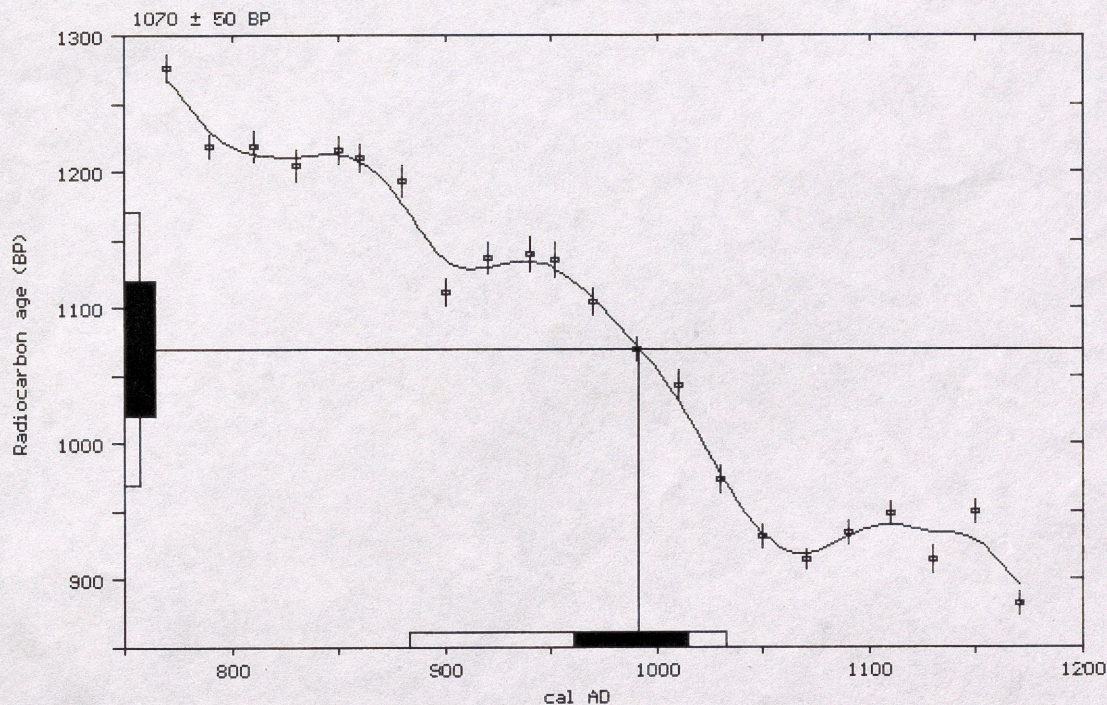
Conventional radiocarbon age:  $1070 \pm 50$  BP

Calibrated results:  
(2 sigma, 95% probability) cal AD 885 to 1035

Intercept data:

Intercept of radiocarbon age  
with calibration curve: cal AD 990

1 sigma calibrated results: cal AD 960 to 1015  
(68% probability)



### References:

*Pretoria Calibration Curve for Short Lived Samples*

Vogel, J. C., Fuls, A., Visser, E. and Becker, B., 1993, *Radiocarbon* 35(1), p73-86

*A Simplified Approach to Calibrating C14 Dates*

Talma, A. S. and Vogel, J. C., 1993, *Radiocarbon* 35(2), p317-322

*Calibration - 1993*

Stuiver, M., Long, A., Kra, R. S. and Devine, J. M., 1993, *Radiocarbon* 35(1)

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V/T/D/E/CP

# CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-21.5; lab mult.=1)

Laboratory Number: Beta-121574

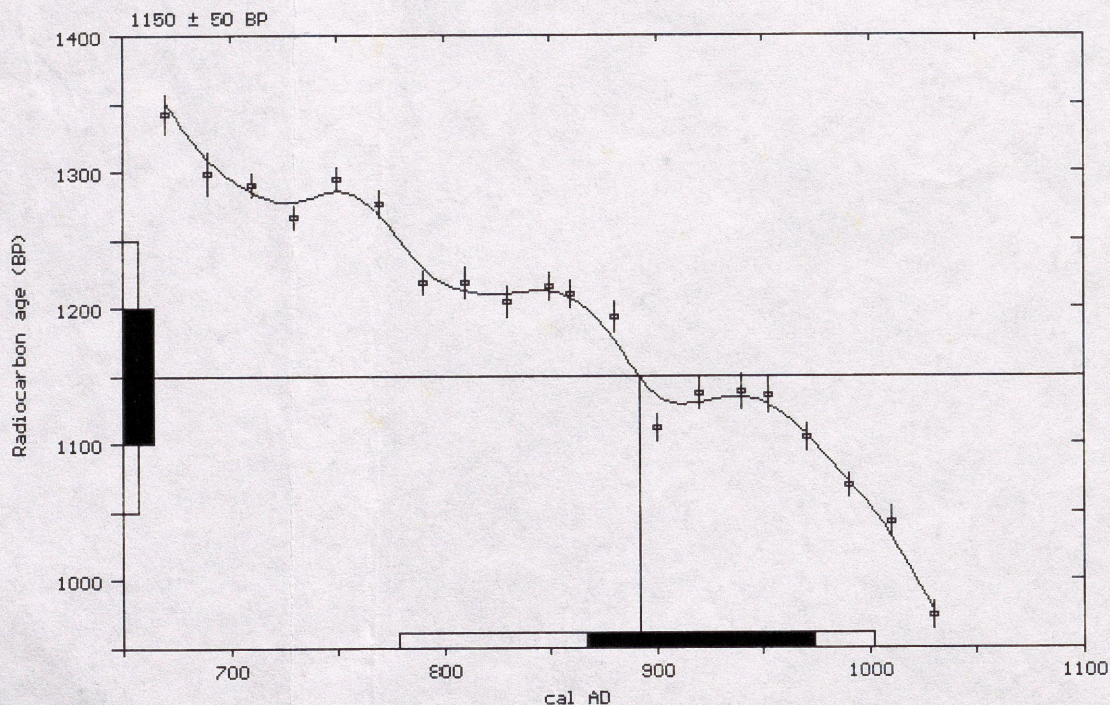
Conventional radiocarbon age: 1150 ± 50 BP

Calibrated results: cal AD 780 to 1000  
(2 sigma, 95% probability)

Intercept data:

Intercept of radiocarbon age  
with calibration curve: cal AD 890

1 sigma calibrated results: cal AD 865 to 975  
(68% probability)



## References:

- Pretoria Calibration Curve for Short Lived Samples*  
Vogel, J. C., Fuls, A., Visser, E. and Becker, B., 1993, Radiocarbon 35(1), p73-86
- A Simplified Approach to Calibrating C14 Dates*  
Talma, A. S. and Vogel, J. C., 1993, Radiocarbon 35(2), p317-322
- Calibration - 1993*  
Stuiver, M., Long, A., Kra, R. S. and Devine, J. M., 1993, Radiocarbon 35(1)

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V/T, D/W/CP

# CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.4:lab mult.=1)

Laboratory Number: Beta-121575

Conventional radiocarbon age: 1090 ± 50 BP

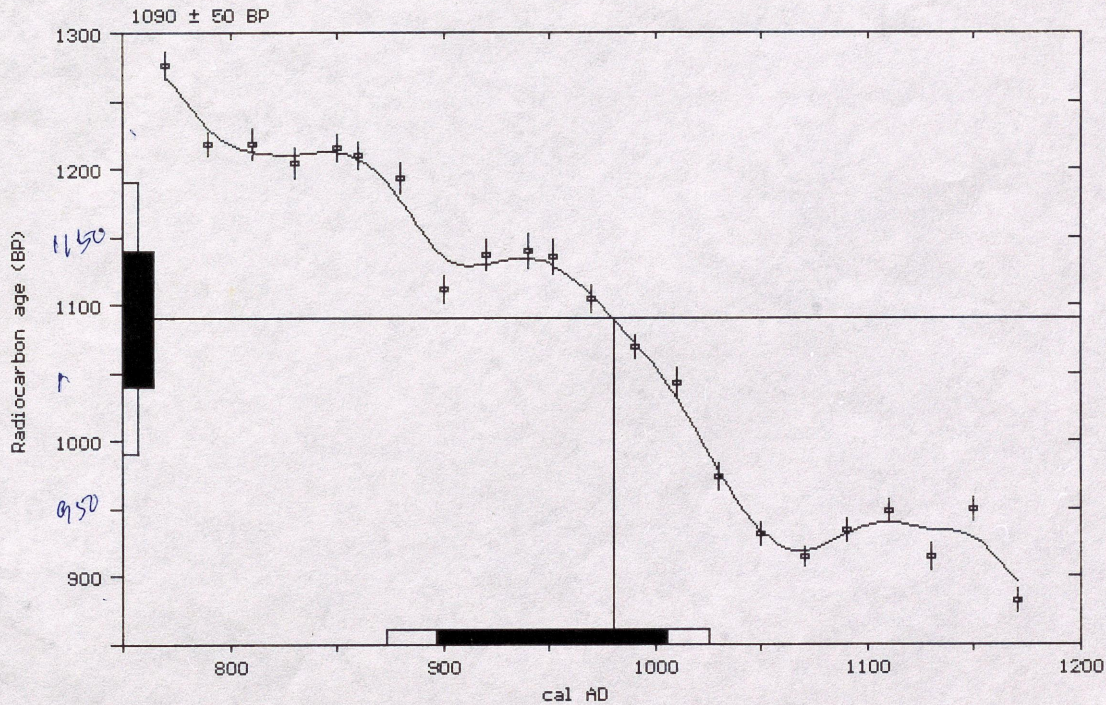
Calibrated results: cal AD 875 to 1025  
(2 sigma, 95% probability)

Intercept data:

Intercept of radiocarbon age with calibration curve: cal AD 980

1 sigma calibrated results: cal AD 895 to 1005  
(68% probability)

2577 AD 875-1025



References:

*Pretoria Calibration Curve for Short Lived Samples*  
 Vogel, J. C., Fuls, A., Visser, E. and Becker, B., 1993, Radiocarbon 35(1), p73-86  
*A Simplified Approach to Calibrating C14 Dates*  
 Talma, A. S. and Vogel, J. C., 1993, Radiocarbon 35(2), p317-322  
*Calibration - 1993*  
 Stuiver, M., Long, A., Kra, R. S. and Devine, J. M., 1993, Radiocarbon 35(1)

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Buddy Schweig, 08:43 AM 10/12/98, Re: Kutch samples

X-Sender: schweig@gandalf.ceri.memphis.edu  
Date: Mon, 12 Oct 1998 08:43:53 -0600  
To: Rajendran <geo@giasmd01.vsnl.net.in>  
From: Buddy Schweig <schweig@ceri.memphis.edu>  
Subject: Re: Kutch samples  
X-MIME-Autoconverted: from quoted-printable to 8bit by giasmd01.vsnl.net.in id TAA14568

>Dear Buddy,  
>  
> We have some replacement samples from Kutch. I will send those  
>samples in  
>a week. Will it be okay?  
>  
> Regards  
>  
>CP

The same day as your message arrived, I received the following results from Beta Analytic. I suggest you look at these dates first to make sure that you still need to send the additional samples. Money is a little tighter now and they did charge me some preparation fee for the samples that did not work out. So if you really need the two additional samples dates, go ahead and send them, but if the dates below are good enough, let's stick with them.

Buddy

Here are the results. I will fax you more information when it arrives:

THIS IS A COPY OF THE REPORT MAILED TO YOU TODAY. CALENDAR CALIBRATIONS ARE NOT INCLUDED.

Dear Dr. Schweig:

Please find enclosed the radiocarbon dating results for five small samples of charred material which were received on August 26. They each provided plenty of carbon for accurate AMS analysis and all analytical steps went normally. If you have any questions, please do not hesitate to contact us.

The cost of four of the analyses was charged to your VISA card. A receipt is enclosed. Thank you. The fifth (plus two pretreatment and examination charges) were invoiced separately to Sheila Davidson (copy also enclosed).

Darden Hood  
Co-director

DATING RESULTS:

Dr. Eugene Schweig August 26, 1998

University of Memphis  
1998

October 5,

YY

YYYYYYYYYY

Sample Data	Measured	C13/C12
Conventional	C14 Age	Ratio
C14 Age (*)		

YY

YYYYYYYYYY

Beta-121569	1120 +/- 50 BP	-25.5 o/oo	1110
+/- 50 BP			

SAMPLE #: V/T3/D/3/CP  
ANALYSIS: Standard-AMS

MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid

Beta-121572 390 +/- 50 BP -24.8 o/oo 390  
+/- 50 BP

SAMPLE #: V/T2/D/1/CP  
ANALYSIS: Standard-AMS  
MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid

Beta-121573 1060 +/- 50 BP -24.7 o/oo 1070  
+/- 50 BP

SAMPLE #: V/T1/D/E4/CP  
ANALYSIS: Standard-AMS  
MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid

Beta-121574 1090 +/- 50 BP -21.5 o/oo 1150  
+/- 50 BP

SAMPLE #: V/T1/D/E/CP  
ANALYSIS: Standard-AMS  
MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid

Beta-121575 1100 +/- 50 BP -25.4 o/oo 1090  
+/- 50 BP

SAMPLE #: V/T1/D/W/CP  
ANALYSIS: Standard-AMS  
MATERIAL/PRETREATMENT:(charred material): acid/alkali/acid

NOTE: It is important to read the calendar calibration information and to use the calendar calibrated results (reported separately) when interpreting these results in AD/BC terms.

Dates are reported as RCYBP (radiocarbon years before present, "present"= 1950A.D.). By international convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards. Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (\*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 Age.

!!  
! BETA ANALYTIC, INC !Tel. 305-667-5167 !  
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! MIAMI, FL 33155 !E-mail beta@analytic.win.net !  
! !!!

-----  
Eugene Schweig

Buddy Schweig, 08:43 AM 10/12/98, Re: Kutch samples

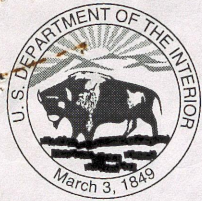
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Central U.S. Coordinator  
Earthquake Hazards Program  
U.S. Geological Survey

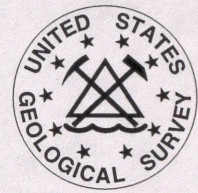
address:  
U.S. Geological Survey  
Campus Box 526590  
The University of Memphis  
Memphis, TN 38152-6590

(901) 678-4974  
Fax: (901) 678-4897

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United States Department of the Interior  
GEOLOGICAL SURVEY  
The University of Memphis  
Campus Box 526590  
Memphis, TN 38152-6590



Memorandum

TO: C. P. Rajendran  
FROM: Buddy Schweig *Buddy*  
DATE: October 13, 1998  
SUBJECT: Radiocarbon dates

Attached are the results from the radiocarbon dating, when reporting the calendar ages, be sure to use the 2 sigma results. If you have any questions, be sure to let me know. I have also included both sides of a the form I have to turn in with samples. If you send me any more samples, fill out as much of this form as you can, particularly the lower third of the first page and a sketch on the second page, if possible. Thanks!

**ROUTING & REQUEST**

**Please...**

- Read
- Handle
- Approve

**And...**

- Forward
- Return
- Keep or Toss
- Review with Me

To: Mr. Rajendran  
-sorry for the delay.  
We could not get access  
to your fax machine.

From: Shelia Jamison  
cp Buddy Schweig

Date: 10-16

Post-it™ 7664 ©3M 1993



**BETA ANALYTIC INC.**

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## REPORT OF RADIOCARBON DATING ANALYSES

Dr. C. P. Rajendran

Report Date: 5/9/02

Centre for Earth Science Studies

*Dwarka*

Material Received: 4/1/02

Sample Data	Measured Radiocarbon Age	$^{13}\text{C}/^{12}\text{C}$ Ratio	Conventional Radiocarbon Age(*)
Beta - 166356 ✓ SAMPLE : BDK-N-T ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal BC 50 to Cal AD 100 (Cal BP 2000 to 1860)	1990 +/- 40 BP	-25.8 o/oo	1980 +/- 40 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (\*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

Dwarke  
BPK-2-T

# CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.8:lab. mult=1)

Laboratory number: Beta-166356

Conventional radiocarbon age: 1980±40 BP

2 Sigma calibrated result: Cal BC 50 to Cal AD 100 (Cal BP 2060 to 1860)

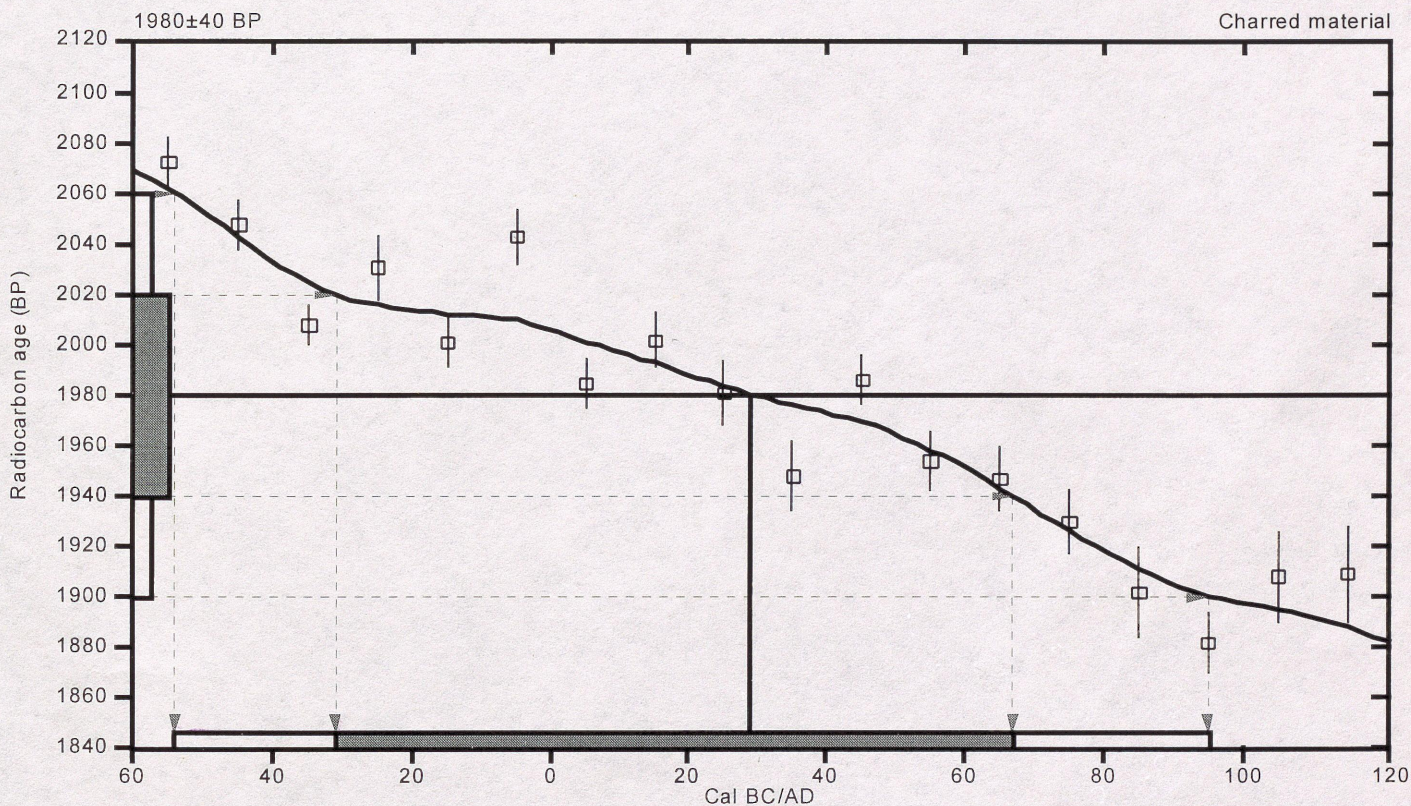
Intercept data

Intercept of radiocarbon age  
with calibration curve:

Cal AD 30 (Cal BP 1920)

1 Sigma calibrated result:  
(68% probability)

Cal BC 30 to Cal AD 70 (Cal BP 1980 to 1880)



## References:

Database used

Calibration Database

Editorial Comment

Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii

INTCAL98 Radiocarbon Age Calibration

Stuiver, M., et al., 1998, Radiocarbon 40(3), p1041-1083

Mathematics

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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