From: abridle (Alan Bridle)
To: rperley
Subject: HTML page on Synthesis Imaging Proceedings
Date: Fri, 2 Dec 1994 16:29:49 -0500

Rick,

In preparation for my upcoming role as documentor for aips++
I am putting together some HTML-based documents for VLAPLAN.
In the process I generated a page on the Synthesis Imaging
courses. As this stuff will go onto the NRAO Web pages
I have also mentioned the upcoming school. Take a look at
this draft and tell me if it's o.k. by you:

A.
===

<!DOCTYPE HTML SYSTEM "html.dtd">
<HTML>
<HEAD><TITLE>The NRAO Synthesis Imaging Summer School</TITLE></HEAD>
<BODY>
<H2>The NRAO Synthesis Imaging Summer School</H2>
<HR>
<P>The NRAO has hosted a series of Summer Schools in Socorro, New
Mexico on the principles and techniques of synthesis imaging. The
series has proven to be popular with scientists and graduate students
studying radio astronomy. In these Summer Schools, NRAO staff members
give lectures and tutorials in most of the theoretical and practical
aspects of radio interferometry and of Fourier synthesis imaging.</P>
<HR>
<P>The lectures from the third Summer School, held in June 1988, were
edited by Rick Perley, Fred Schwab and Alan Bridle into a book entitled
<I>Synthesis Imaging in Radio Astronomy</I>. This was published in
1989 as Volume 6 of the Astronomical Society of the Pacific's
<A HREF="http://www.stsci.edu/ftp/pasp/ASP_conference_series"
><I>Conference Series</I></A> (ISBN 0-937707-23-6). These lectures
have since formed the basis of several other courses in synthesis
imaging, and were reprinted by the A.S.P. in August 1994.</P>
<P>You may obtain these lectures in several ways:</P>
<UL>
<LI>Order as a <A HREF="http://www.stsci.edu/ftp/pasp/ASP_conference_series"
>book</A> directly from the A.S.P. Publications Office,</LI>
<LI>Download as a large (2.3 Mb, 500-page)
<A HREF="http://www.nrao.edu/doc/vla/synthesisimaging/wkshp.ps"
>postscript file</A> containing all the lecture text but no Figures.</LI>

</UL>
<HR>
<P>The next (fifth) Summer School will be held in Socorro from Monday,
June 5 to Saturday, June 10, 1995. The first four and one-half days
will be devoted to lectures on aperture synthesis theory and techniques.
 Demonstrations of data collection, calibration and imaging from both
the VLA and VLBA will be given on Friday afternoon and Saturday (June
9-10). </P>
<P>For further information about plans for the fifth Summer School,
contact Terry Romero in Socorro:</P>
<UL>

```
<LI>by telephone at <I>505-835-7315</I> or</LI>
<LI>by <A HREF="mailto:tromero@nrao.edu">E-mail </A> to <I>tromero@nrao.edu</I></LI>
</UL>
<HR>
<ADDRESS>abridle@nrao.edu</ADDRESS>
</BODY>
</HTML>
```

From: Rick Perley <rperley@aoc.nrao.edu>
To: abridle@polaris.cv.nrao.edu
Subject: Re: HTML page on Synthesis Imaging Proceedings
Date: Fri, 2 Dec 1994 16:31:39 -0700

Alan:

About the only thing I would add is that there was a VLBA summer school, last summer. The proceedings are coming out 'soon' -- ask Zensus (who I suppose has shown up now) about this.

We might elect to put the 'demo' period on Wednesday, rather than on the weekend (speaking for the next lecture series). A final decision has yet to be made here.

Rick

From: abridle (Alan Bridle)
To: rperley
Subject: Synthesis Imaging Lectures
Date: Wed, 21 Dec 1994 13:15:57 -0500

Hi Rick,

As a test for the aips++ documentation system I have converted my
Hitch-hiker's Guide summer school lecture from Fred's original macro
package into a LaTeX article format. The reason for this is that
there are automated tools for generating HTML hypertext file
structures from LaTeX format, and this will allow the lecture to be
integrated with aips++ documentation and displayed using standard WWW
browsers. It will also, of course, let me put the lecture directly on
the WWW, not just as part of the huge, and frozen, PostScript dump of
the whole course text that we make available there now.

I think for the upcoming lecture series we might consider a couple of
strategies.

First, we should do it within one of the standard LaTeX macro packages
instead of in a home-grown variant of AMSTeX as before. This will
make it easier to convert relevant bits of it to HTML.

Second, we might wonder if paper publication of it via ASP is a good
idea this time. Maybe we should go for electronic publication from
the get-go, with the WWW as the end target? That would of course make
it very widely available from the start, and would allow us to update
it more easily as needed. It would also faciliate the integration
with the aips++ documentation.

In the meanwhile, I am going to convert selected bits of the old
lectures into HTML for use with aips++. So far this is just a demo
project and I'll not worry about conflicting with the paper version
that ASP has reprinted. It if worries them I'll just say I'm
plagiarising myself!

Merry Christmas

A.

P.S. We might also consider opening a WWW page for the VLA upgrade?

From: Rick Perley <rperley@aoc.nrao.edu>
To: abridle@polaris.cv.nrao.edu
Subject: Re: Synthesis Imaging Lectures
Date: Wed, 21 Dec 1994 11:49:51 -0700

Alan:

1) Certainly we should use a proper LaTeX macro package. I have asked
Fred if he's interested in being an editor -- he has replied positively. I
don't imagine he'd object to this new route?

2) I'm a little less certain about this. I really wonder about how
much use is being made of the WWW. My evidence is the VLA Upgrade report. This
was put in last Spring, and was advertised as being there. When I got to the
Penticton meeting last August, we found that only one person (out of nearly 100)
both: a) knew it was there, and b) had gotten a copy of it. In some way, it
seems to me that the WWW is rather like an enormous library. Filled with
good things that very few people will ever make the effort to use. People LIKE
to have paper copies, properly bound, on their shelves. Merely knowing that
a complete copy is available in WWW may not be good enough. I fear that
most people, even young, computer oriented types, EXPECT to have a bound volume.
We're dealing with sociology here, I guess. Although perceptions are changing,
I wonder if they have changed enough to warrant ONLY a computer version
available. To me, the question of how we should do this is very much open.

3) I think having a specific WWW page for the VLA upgrade is a great
idea. Want to design it?

Incidentally, we have been churning out numbers for the upcoming
meeting. I have consulted the receiver and antenna gurus, and have come up
with a table of expected sensitivities for an improved VLA. Assuming the
best in receivers, and improved optics for some bands, and the full 2 GHz
bandwidth (1 in each polarization), the numbers are spectacular! Better than
2 microJy in 12 hours between 2.7 and 38 GHz. And, if we put in the full
35% bandwidth (an idea floating around here -- to give up spectral and
polarization accuracy for maximum BW) we get under 1 microJy from 5 GHz to
40 Ghz. And, if we figure in 7 additional antennas (4 new, 3 VLBA), the
numbers drop by a factor of about .85 (assuming full bandwidth). Although
these are rosy estimates, and unlikely to be obtained in full, most of these
factors (which are a factor of 40 better than current for 1.3 cm), can be
achieved fairly easily.

Miller has continued to completely ignore this workshop. Tim B. made
him sign the dinner invitation form, though. And he is thinking of forcing
him to make an introductory speech and a closing speech as well. I think this
not a good idea, and have urged Tim to leave Miller out, if that`s what he
wants.

Speaking of out, we have dropped Juan Uson off. The guy is impossible
to deal with. Better put, he is impossible to rely upon. Last week, he spent
an hour in Tim's office, moaning that this is an impossible task, that there's
no hope for any money, or interest from the administration, that he wanted to
withdraw from the talk Tim had asked him to give, and that he felt that a better
use of his time would be to go skiing. (I actually heard part of this myself).
I urged Tim to take Juan at his word, and ask Peter N. to give the low-
frequency talk. By Monday, Juan had reversed himself. But Tim told him that
he was out, and that Peter was in. Juan has been talking about moving back
to C'Ville. I'd be willing to pay for his ticket! But his wife apparently

has nixed the idea, saying she likes her job here, and won't move. Darn. I was hoping he'd leave, and waste your time, rather than ours. He is at work now only about 10% of the time (no kidding!), and most of that is spent on the telephone.

Rick

From: Rick Perley <rperley@aoc.nrao.edu>
To: abridle
Subject: Summer School planning
Date: Wed, 15 Feb 1995 13:31:43 -0700

Alan:

I held an ad-hoc meeting last week, to help sort out thinking for the
June Summer School.

An issue came up that I'd like to tap your opinion on: We have never
involved Eric Greisen in these things, partly because of his prickly
reputation. This omission has deeply offended him (I know this, because he
told me so, although not in those words) -- perhaps 'wounded' is a better
verb than 'offended'. Whatever, it occurs to me that it would be proper to
involve him in some way. I talked with him about this, during his last visit
here in November. He was quite interested. I had at that time thought that
perhaps he could give the lecture on 'imaging', since he is now heavily
involved in straightening out all the code in that area.

I tried this idea out in the meeting mentioned above, and got a
 *** Very Negative Reaction *** from Miller and Tim. Especially Miller. I
have subsequently received an e-mail from Tim, in which he stresses how *bad*
an idea this is. (His emphasis, this time). The stated reason is that it
is believed by them that Eric would be a poor lecturer. I wonder if there is
some personal bias involved.

I'd like to hear your opinion on this matter. This is definitely going
to cause me some headaches -- I think Eric believes he's going to be asked to
lecture. I'd really like to get him usefully plugged in, for a lot of good
reasons. I don't want to do anything which would derail his current (at least
as of last Nov.) very productive mode, or the good relations I've now gotten
with him (after Very Great Effort on my part).

Tim is also negative on Eli Brinks' capabilities in this area! I
wonder if there is another agenda going on here -- Elie and Miller are at odds
these days (Miller accused Elie of being `disloyal' at his personnel review
last Fall, and Elie is definitely not happy with his current situation. Tim
was the 'earwitness' to this interview (for some reason, all of Miller's
personnel interviews had either Dick or Tim sitting in. Good thing I'm not
in that group any more -- I would have refused to participate under such a
setup).

I'd like to set up a real working group for the summer school. THe
last meeting was an invitation to everybody to sit in -- about a dozen showed
up. Now I'd like to form a smaller group. Tim, me, a VLBA'er, a couple others.
Would you like to be a member? THe idea is to coordinate lectures, set
timescales, etc.

Regards
Rick

From: abridle (Alan Bridle)
To: Rick Perley <rperley@aoc.nrao.edu>
Subject: Re: Summer School planning
Date: Wed, 15 Feb 1995 15:51:39 -0500

Rick Perley writes:

>   An issue came up that I'd like to tap your opinion on: We have never
> involved Eric Greisen in these things, partly because of his prickly
> reputation. This omission has deeply offended him (I know this, because he
> told me so, although not in those words) -- perhaps 'wounded' is a better
> verb than 'offended'. Whatever, it occurs to me that it would be proper to
> involve him in some way. I talked with him about this, during his last visit
> here in November. He was quite interested. I had at that time thought that
> perhaps he could give the lecture on 'imaging', since he is now heavily
> involved in straightening out all the code in that area.

I can confirm that he is wounded by never having been invited. He does not
enjoy giving lectures but has done so in various software conferences. He
will probably go into a bit of a funk when actually invited but then do
a reasonable job. He would not give a barn-burner of a talk, for sure, but
any lecture he gives will be technically correct and complete.

>   I tried this idea out in the meeting mentioned above, and got a
> *** Very Negative Reaction *** from Miller and Tim. Especially Miller. I
> have subsequently received an e-mail from Tim, in which he stresses how *bad*
> an idea this is. (His emphasis, this time). The stated reason is that it
> is believed by them that Eric would be a poor lecturer. I wonder if there is
> some personal bias involved.

Could be, they both despise Eric for a variety of reasons that do not
have a lot to do with his technical competence, more with political
fights they have gotten into over the years. I think the only way to
see whether Eric is really a suitable lecturer is to give him a
chance. He does take responsibilities seriously and won't evaporate
at the last moment as some have tried to do. And he couldn't be worse
than certain of our sensitivity and calibration lecturers were in
earlier schools, could he?

>
>   I'd like to set up a real working group for the summer school. THe
> last meeting was an invitation to everybody to sit in -- about a dozen showed
> up. Now I'd like to form a smaller group. Tim, me, a VLBA'er, a couple others.
> Would you like to be a member? The idea is to coordinate lectures, set
> timescales, etc.
>

I'd better be a bit careful here as the aips++ documentation stuff is capable
of consuming a huge chunk of my time and I also have the VLA upgrade document
looming. I'm happy to give advice on this area close to my heart, and I
definitely want to plan on integrating the summer school lectures into
the aips++ doc system later in the year, but I had better not pretend that
I can commit major time to it between now and the summer school itself.

Alan:

Thanks for the comments. I'll be meeting with Tim, and we'll see
how that goes.

As for the planning, I had in mind only a couple (maybe more than a
couple, but N definitely less than 6) of phone meetings, just to chew things
over a bit.

Rick

From: Rick Perley <rperley@aoc.nrao.edu>
To: abridle
Subject: Comments, SVP
Date: Thu, 23 Feb 1995 14:20:58 -0700

Alan:

I just sketched out a possible agenda for SISS '95. I'd like your
comments, if you can spare a few minutes. We`re attempting this year to keep
the 'oddball' subjects out, and stick to the basics.

Also, I need some advice. Only 25 people have registered so far (!).
Apparently, nobody reads the NRAO Newletter, or our future user base is about
to dry up. So, I intend to make the second announcement over the internet.
How best to do that? I'm about to ask the local gurus about this, but I"m
sure you know quite a bit about this subject. How do we best get the word out
to the proper audience about our Summer School? (Cheaply, since we have no
official budget).

Regards
Rick

From: Rick Perley <rperley@aoc.nrao.edu>
To: abridle
Subject: Oops
Date: Thu, 23 Feb 1995 14:32:05 -0700

X-Sun-Data-Type: text
X-Sun-Data-Description: text
X-Sun-Data-Name: text
X-Sun-Content-Lines: 2

    ... forgot the agenda...

X-Sun-Data-Type: default
X-Sun-Data-Description: default
X-Sun-Data-Name: schedule.txt
X-Sun-Content-Lines: 94

    Working Draft of Lecture Series for 5th June Syn. Img. Sum. School

        June 5 - 9 1995. Socorro, N.M.

The current state of the lecture series is indicated below. Names or items in
[brackets] indicates some uncertainty.

    Monday, June 5.

Time   Title   Lecturer   Comments

0830 'Opening Ceremonies'   [Miller Goss]
0900 Coherence in Radio Astronomy   Juan Uson Barry's lecture, revisited.
1030 Interferometry 1   Tony Beasley   Dick Thompson's,   "
1200 Lunch
1330 Antennas in Radio Astronomy Peter Napier   Tried and True
1500 Interferometry 2   Larry D'Addario   A combination of Correlator and
                        Sensitivity lectures.
1630 Discussion Groups   various

    Tuesday, June 6.

0900 Polarization   [Bill Cotton]   Hasn't replied to my invitation.
1030 Atmospheric Effects   [Jim Moran]   Jim will confirm shortly
1200 Lunch
1330 Calibration/Editing   Craig Walker
1500 Imaging and Deconvolution   Tim Cornwell
1630 Discussion Groups

    Wednesday June 7.

0900 Self-Calibration   Tim Cornwell
1030 Spectral Line 1   [Elie Brinks]   Elie is coordinating all spectral line
1200 Lunch   talks.
1330 Data Tutorial (all afternoon)

    Thursday, June 8.

0900	Spectral Line 2	[Doug Wood]
1030	Spectral Line 3	[Phil Diamond/Athol Kemball] VLBI Spectral Line
1200	Lunch	
1330	Limitations to Imaging	Rick Perley 'Why my image looks bad'
1500	Mosaicing Techniques	[Mark Holdaway] Keep this less than 1 hour.
1545	Open Slot -- for short topic	
1630	Discussion Groups	
1800	Summer School Dinner @ Macey Center	

Friday, June 9.

0900	Solar Radio Interferometry	Tim Bastian	
0945	Planetary Radio Interferometry	Bryan Butler	
1030	Astrometry and Geodesy	Ed Fomalont	
1200	Lunch		
1330	Observational Strategies 1	Alan Bridle	VLA-oriented
1500	Observational Strategies 2	Joan Wrobel	VLBA-oriented
1630	Wrap-up	[Rick Perley]	

Comments:

1) We currently show most lectures to be about an hour long, with a generous break in
    between. We could opt to stack each morning's and afternoon's together, and have
    two discussion groups per day -- one in the morning, one in the afternoon.

2) Another option is to add more 'short lectures'. If you like this, suggest topics
    and lecturers.

3) The 'Image Analysis' lecture has disappeared. For good reason. But we could
    recover it, if anybody thinks there is something useful to say.

4) The `Data Tutorial', scheduled for Wednesday afternoon, in fact can be run every
    evening except Thursday. We intend to set up four 'data practicums' -- these
    will be ftp-accessible datasets, each with an accompanying text file describing the
    steps needed for calibration and imaging. Also accompanying each will be a set
    of 'final results', as derived by the 'experts'. The four data practicums will
    cover:

Subject	Responsible Person
1) Continuum/polariation, multiple config.	Rick Perley (Cyg A, naturally).
2) Spectral Line	Elie Brinks (Some big galaxy)
3) VLBI continuum	Phil Diamond (already done)
4) VLBI spectral line	To Be Assigned.

    We intend to have these available, on line, well before the opening lecture.
    Attendees can work on any, or all, of these, at any time. We will reserve some of the
    public workstations to be available in the evenings, and on Wednesday afternoon.

5) Shall we organize some activity of Saturday? I presume a number of people will be
    staying over Saturday night. This might only be some sort of hiking/touring act   vity.

                        Rick Perley
                        23/Feb/95

ANNOUNCEMENT OF THE FIFTH NATIONAL RADIO ASTRONOMY OBSERVATORY
SUMMER SCHOOL IN SYNTHESIS IMAGING.

June 5 to 9, 1995. Socorro, N.M.

-- Please Distribute to All Interested Students --

The National Radio Astronomy Observatory will be conducting a
Synthesis Imaging Summer School from June 5th through June 9th in
Socorro, N.M. The purpose of this Summer School will be to instruct
students in the principles and methods of image formation from radio
interferometric data. The level of the summer school will be
appropriate for incoming graduate students and advanced undergradutes.
The format will include lectures, special problems tutorials, and
hands-on data analysis with local experts.

The Summer School will cover all basic aspects of radio
interferometry, including both connected element ("VLA") and "VLBI"
interferometers. Lectures will be given by NRAO staff on topics
ranging from principles of coherence to detailed techniques of image
formation and deconvolution. The range of subjects will be the same
as in past Summer Schools, and can be reviewed by consulting Synthesis
Imaging in Radio Astronomy, the published collection of lectures from
the 3rd NRAO Synthesis Imaging Summer School (ASP Conference Series,
Volume 6, 1989).

A data reduction tutorial will be held on Monday and Tuesday evenings
(June 5 and 6) and on Wednesday, June 7 to allow attendees to get
"hands-on" experience with data calibration and imaging for both VLA
and VLBA data. The data tutorial will take the form of three
illustrative datasets -- a multi-configuration VLA dataset, a VLA
spectral line dataset, and a VLBA dataset. Each of these will be
available via ftp well before the summer school so that students may
have access to, and experiment with data techniques beforehand. Each
dataset will be accompanied by a set of pre-defined data reduction
procedures, and a 'README' file describing how to obtain, calibrate,
and image the data.

There will be no limit to attendance. A minimal fee of $35 will be
assessed to cover our expenses. NRAO will provide free transportation
to and from the Albuquerque airport on June 4 and June 9 and 10. We
have reserved dormitory rooms (mostly doubles) at New Mexico Tech, for
the week of the summer school. The cost is $15 per double, and $18
per single, per person, per night. Friday and Saturday night stayover
is possible following the meeting. Note: Early arrivals cannot be
accommodated in the dormitories. A list of Socorro motels will be
sent to those preferring individual accommodation. Motel registration
is the responsibility of attendees.

A non-refundable full campus meal ticket, covering all meals from
Monday to Friday, inclusive, is available for $50. Individual meals
can be purchased for $4, $4.50 and $5, for breakfast, lunch, and

dinner, respectively. For those interested in dining out, a list of
Socorro restaurants will be sent to all registrants. A summer school
dinner, held outdoors on the New Mexico Tech campus, will be on
Wednesday evening, and will be free to all participants.

You may register for this meeting by filling out the following
registration form, and e-mailing it by April 1, 1995 to: Terry Romero:
tromero@nrao.edu. Questions about the content and organization of the
lectures should be addressed to Rick Perley (rperley@nrao.edu).

(Cut Here)

NAME:

POSTAL ADDRESS:

E-MAIL ADDRESS:

FAX:
TELEPHONE:

If your address during April/May is different than above, please include that
address along with applicable dates.

Please indicate your profession level:
( ) Undergraduate
( ) Graduate Student
( ) Postdoctoral
( ) Scientific or Engineering staff
( ) Other

Have you observed with the
VLA?   ( ) Yes ( ) No
VLBA? ( ) Yes ( ) No

Check one:
( ) I definitely plan to attend.
( ) I hope to attend and will confirm later.

I wish to attend:
( ) all 5 lecture days June (5 - 9)
( ) the Data Reduction Tutorial (June 5, 6, 7
)
Please reserve dormitory accommodation for me as follows:
 ( )single room, no meals   ( )single room and full campus meal ticket
 ( )double room, no meals   ( )double room and full campus meal ticket

I requested a double dormitory room and I want to share it with
                ( ) a specific person - Name (   )
                ( ) any male
                ( ) any female

I intend to stay in a motel and
                ( ) I want a full campus meal ticket.
                ( ) I will purchase some campus meals individually.

(Motel information will be mailed to you later)

You will receive an invoice with the next mailing.

If there are any subjects you wish to have discussed, please list them
below, or E-Mail to: rperley@nrao.edu.

From: Rick Perley <rperley@aoc.nrao.edu>
Sender: owner-bananas@tarsier.CV.NRAO.EDU
To: bananas@tarsier.CV.NRAO.EDU
Subject: Re: Synthesis Imaging Workshop in Socorro, N.M.
Date: Wed, 22 Mar 1995 13:54:28 -0700

Eric:

I'm still working on the lecture list/lecturers. But certainly the visiting lecturers will have a place to stay at the guesthouse.
I'll get back to you shortly about the detailed lectures. I've got a small problem I have to solve...

Rick

From: Rick Perley <rperley@aoc.nrao.edu>
To: tbastian, tbeasley, ebrinks, bbutler, cchandler, mclaussen, tcornwell,
     pdiamond, efomalont, mholdaway, pnapier, tromero, jromney, mrupen,
     juson, cwalker, jwrobel, ldaddari, bcotton, abridle
Subject: Lecture set, current version
Date: Wed, 12 Apr 1995 15:39:28 -0600

X-Sun-Data-Type: text
X-Sun-Data-Description: text
X-Sun-Data-Name: text
X-Sun-Content-Lines: 4

        Attached is the current situation.

        Rick

X-Sun-Data-Type: default
X-Sun-Data-Description: default
X-Sun-Data-Name: schedule.txt
X-Sun-Content-Lines: 98

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                                Sensitivity lectures.
1630 Discussion Groups   various

        Tuesday, June 6.

0900 Polarization   Bill Cotton
1030 Atmospheric Effects   Ed Fomalont   Based on Jim MOran's super-lecture.
1200 Lunch
1330 Calibration/Editing   Craig Walker
1500 Imaging and Deconvolution   Tim Cornwell
1630 Discussion Groups

        Wednesday June 7.

0900 Self-Calibration   Tim Cornwell
1030 Spectral Line 1 - introduction   Elie Brinks

```
1200 Lunch
1330 Data Tutorial (all afternoon)
```

Thursday, June 8.

```
0900 Spectral Line 2 - Advanced    Juan Uson
1030 Spectral Line 3 - VLBI        Mark Claussen
1200 Lunch
1330 Limitations to Imaging        Rick Perley    'Why doesn't my image look great?'
1500 Mosaicing Techniques          Mark Holdaway
1545 Open Slot -- for short topic
1630 Discussion Groups
1800 Summer School Dinner @ Macey Center
```

Friday, June 9.

```
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0945 Planetary Radio Interferometry Bryan Butler
1030 Astrometry and Geodesy         Ed Fomalont
1200      Lunch
1330 Observational Strategies 1      Alan Bridle     VLA-oriented
1500 Observational Strategies 2      Joan Wrobel     VLBA-oriented
1630 Wrap-up                   [Rick Perley?]
```

Comments:

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     staying over Saturday night. This might only be some sort of hiking/touring activity.

Rick Perley
12/Apr/95

From: abridle (Alan Bridle)
To: rperley
Subject: SIRA - part Deux
Date: Mon, 24 Apr 1995 13:37:13 -0400

Rick,

Have had some conversations with Fred re the next Synthesis Imaging
Proceedings. As he mentioned in his message to you, he is somewhat
doubtful about the utility of producing a full book again, as at
least half of the material would repeat the previous one. there is
also the danger that, unless a lot of time is spent editing it,
the consistency we achieved before re notation, definitions, etc.
might be lost. Have you given any thought to simply packaging
the _new_ material into what might be a supplementary volume, which
could be called "Recent Advances in Synthesis Imaging" or some such?
This might be a lot less work and a lot more appropriate.

I have discussed some more with Fred what are the advantages and
disadvantages of converting such tutorial material to hypertext.
I do mean a lot more than "putting the Postscript on the WWW".
The advantages of hypertext documents go beyond just remote
access, they allow people to read material in their own way, in
their own order (i.e. as appropriate to their level of understanding
and their interests), so that the links between all the "nuggests"
of information in a text become a new sort of information. I am
keen to put one form or another of the SIRA onto the WWW as
hypertext as part of the AIPS++ documentation (we are planning
a "tutorial" layer there that might well be linked interactively
to demonstrations based on real data sets once AIPS++ matures).

I would be more interested myself in taking some of the existing
elementary material and putting it into hypertext form than in
generating a "new" book for A.S.P. but what would help the
process enormously would be to have access to all the diagrams
from a new version of SIRA in PostScript form. What would you
think about that?

Cheers, A.

From: Rick Perley <rperley@aoc.nrao.edu>
To: abridle, fschwab
Subject: Proceedings (?)
Date: Wed, 26 Apr 1995 11:25:19 -0600

Alan, Fred:

Sorry about the long delay in responding. Things are * Real Busy *
here. I'll be freer after May 7. And I'll be in C'Ville May 10 and 11.

I agree that there is little need for an entire new book. Besides that
I certainly don't have the time to give to such an endeavor, and I presume
neither of you two do either.

I agree that putting our current, and any future additional, documents
on this subject into hypertext would be useful. I don't know much about
getting the diagrams into PostScript form. You'll have to educate me about
that (but wait until I get to C'Ville -- there is no time now out here).

I guess I'll see Alan in GB next week. I have some nifty new Cyg A
polarization results -- or at least I should by the time I get there. I think
I need a decent laptop, running AIPS, so I can work on airplanes, cars, etc.
(Gawd, what an AWFUL idea).

Rick

From: abridle (Alan Bridle)
To: tromero
Subject: Accommodation
Date: Fri, 5 May 1995 10:46:35 -0400

Hi Teresa,

When I saw Rick in Green Bank he said you would be making some
arrangements for accommodation at the VSQ for the visiting summer
school lecturers, of whom I am one. I am just getting my travel plan
organized now and will arrive by private car on Thursday 1 June
(probably late evening). I'm planning to stay until about Thursday 15
June, though departure date is still a bit uncertain as I am driving
and will adapt to what is necessary for getting course materials
together after the summer school is over.

Could you book me in from June 1-15 in any case, or pass this on to
Eileen if that is more appropriate?

Thanks,

Alan

From: Terry Romero <tromero@aoc.nrao.edu>
To: abridle@polaris.cv.nrao.edu
Subject: Re: Accommodation
Date: Fri, 5 May 1995 09:04:24 -0600

Hi Alan,
I have passed on your message to Eileen. It will be taken care of.
See you next month.
Terry

From: abridle (Alan Bridle)
To: Eileen Latasa <elatasa@aoc.nrao.edu>
Subject: Re: NRAO/NM visit
Date: Mon, 8 May 1995 16:16:34 -0400

Hi Eileen,

Thanks for making the reservation for me. I fact I was
just talking with Tim Bastian about some work we are doing
together for the VLA Upgrade project and I now think I
should plan to stay a few more days, until June 19th.
Could you extend my reservation until then? Thanks much.

Alan B.

From: tcornwel@cv3.CV.NRAO.EDU (Tim Cornwell)
To: aips2-workers@zia.aoc.nrao.edu
Subject: Minutes for MMM for 8 May 1995
Date: Tue, 9 May 1995 10:24:21 -0600

Minutes for MMM for 8 May 1995

Editor: Tim Cornwell (tcornwel@nrao.edu)

Attending:
==========

  NFRA: Noordam, van Diepen
  NRAO-AOC: Hjellming, Cornwell
  NRAO-CV: Bridle, Garwood, Glendenning, Horstkotte, Hunt,
       Roberts, Shannon, Simon, Schiebel, Wieringa
  NRAO-GB: Payne

Action Items from Last week
===========================

1. Cornwell: Review Alan's User Documentation Plan [April 24]
Done. Review sent to aips2-doc. Awaiting counter-comments.

General Items
=============

2. Horstkotte: Library documentation status.
Darrel finished. Tim R finished before but not entered in previous
minutes [Sorry, Ed.] So overall the documentation is close to complete.
FITS classes promised by Peter Teuben are the one major hole.

3. Cornwell: Synthesis status
Selfcal program now working from Mosaic. See Mark W's weekly report.

4. Garwood: Single dish status.
12m work on track for test later this month. Brian will glue together
FITS file today. Paul going to GB on Wednesday to demo graphics.

5. Cornwell: Management report
Tim C has moved house. No much else new.

Requested Items:
~~~~~~~~~~~~~~~~

6. Future of Glish: Darrell will distribute his list of prioritized
changes to Glish. A brief overview was given but no substantial changes
were made.

7. Inputs and tasking philosophy: Tim C said that the recent work on
the selfcal demo has convinced him that we need to work on the Inputs
system and the general tasking philosophy. General agreement that the
time is ripe to do this. Bob Garwood commented that we should aim
to fix the general look and feel of at least the glish side of AIPS++
soon so that it is relatively stable from now on.

Bob Hjellming asked about the status of Glish. Tim C said that
his view was the we will stick with Glish for the foreseeable
future both as the control hub and the CLI. Brian commented that we
might replace the control hub (or layer it) when an industry standard
becomes available. He also pointed out that the CLI needs user testing
and that we may have to change it either in minor ways or in major ways.
Ger pointed out that we need to decide on 0 or 1-based indexing.

[In discussions subsequent to the meeting, Tim and Brian agreed that
Brian will do the design required in the inputs and tasking areas.
Implementation will probably be farmed out.]

8. Maintenance of local sites: Jim Horstkotte will be leaving NRAO
for a new position at the end of May. The impact of this was discussed.
There are a couple of separate issues. First Jim does local site maintenance
for CV. We will have to find someone else to take this over. Second,
support of the overall code distribution system is handled now by Jim
and Mark C. Clearly the major burden for this will now fall on Mark C.

9. FITS Classes: Brian reported that the existing FITS classes
require some work. While the design is good, the implementation
leads to a number of difficulties for a programmer wishing to use the
classes. We should fix this soon. Brian and Bob G will write a short
message detailing what needs to be done. This will then be entered
in the list of things to be done and assigned a priority.

Additional items
~~~~~~~~~~~~~~~~~~

10. Jan reported on his presentation to the ESO meeting on calibration.
Much general interest in AIPS++ from participants but little specific
inquiry. ESO's interests may be clarified following appointment of
Data Management leader expected soon.

===
Action Items for next week
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

1. Glendenning and Garwood: List of deficiencies of FITS classes

===
Code under review (from Paul Shannon)
~~~~~~

Class(es)	Author	Submitted	Reviewer	Assigned

No code under review this week.

===
Library Documentation Assignments (from Jim Horstkotte)
~~~~~~

Modules	Documentor	Done Date	Progress
Arrays	Horstkotte	April 7	done

```
Mathematics              --> March 31    0%
Measures                     started

Containers      Schiebel  March 17 done
Exceptions                March 27 done
Glish                     April 7       done
RTTI                      April 7       done

FITS        Teuben        ?             50% (sent back for more)

Graphics   Shannon        March 3       done
Images                         done
Lattices                  done
OS                        done

Tables          van Diepen     February 17    done
KeyWords        van Diepen     March 3        done
IO          van Diepen     end-May        80% (shifted from Hunt)

Utilities   Olnon          March 17 done

Top Level Doc Olnon            March 31 done

Catalogs   Roberts        February 17    done
LinearAlgebra        -             Empty; helped Horstkotte
                         with LA in Arrays
Logging              --> March 3    done
Deconvolution        March 10 done
String in Utilities  -         done
Inputs                   done
```

Travel Plans
============

Business trips:

```
Apr 17 - May 15   Wieringa in Charlottesville
May 12 - May 13   Cornwell, Bridle, Glendenning at GB (Users mtg)
May 14 - May 21   Garwood at 12m (OTFTool tests)
May 25 - May 31   Roberts returns to Socorro
May 29 - Jun 16   Bridle at AOC (Synthesis Imaging workshop)
Jun 12 - Jun 24   Cornwell at NFRA, ESO
July or August    Cornwell at ATNF
```

Vacations:

```
May 24 - May 30   Shannon (1 wk)
May 14 - May 28   Payne
Jun  1 - Jun 16   Schiebel
Jul (2 weeks)    Cornwell
Jul 10 - Jul 24   Hunt
Jul 17 - Aug  5   van Diepen
```

From: Rick Perley <rperley@aoc.nrao.edu>
To: abridle, fschwab
Subject: SISS lectures
Date: Thu, 11 May 1995 08:59:26 -0600

    Gentlemen:

    Finally, I"m doing some real work on the Summer School. Some
individuals are actually writing their lectures now!

    I think we agreed not to put out a book. But the individual lectures
need to be printed up and reproduced, at least in note form, before the
lectures are given. Should we provide some sort of template for this? What
do you suggest we do?

    Rick

NRAO Synthesis Imaging Schoool -- June 5 - 9, 1995

Dear Participant:

This e-mailing is to update you on planning for the Synthesis
Imaging Summer School. In general, planning is moving ahead well, and
we expect a busy week. Over 115 people have officially registered,
while another 35 or so are 'tentative'. Including the local NRAO
staff and students, and others from nearby institutions, we expect to
well exceed 150 attendees.

I have included below a modified timetable. You will note
that there is a significant change -- we have moved the 'data
tutorial' from Wednesday afternoon to Friday afternoon. This change
was necessitated by a scheduling conflict, but in hindsight, it makes
sense to do the tutorial at the end of the summer school, rather than
in the middle. The AOC public computers will be available each
preceding evening to permit attendees to experiment with data
reduction techniques. By Friday, we hope that all attendees will have
some experience with the various datasets, so that the scheduled
tutorial can be more directed towards clarifying problems encountered
during the week.

The NRAO Synthesis Imaging Summer School Lecture Schedule

June 5 - 9 1995. Socorro, N.M.

Monday, June 5.

Time	Title	Lecturer
0830	Opening Welcome	Rick Perley
0900	Coherence in Radio Astronomy	Juan Uson
1030	Elements of Interferometry	Tony Beasley
1200	Lunch	
1330	Antennas in Radio Astronomy	Peter Napier
1500	Correlators and Sensitivity	Larry D'Addario
1630	Discussion Groups	various

Tuesday, June 6.

0900	Atmospheric Effects	Ed Fomalont
1030	Calibration/Editing	Craig Walker
1200	Lunch	
1330	Imaging 1	Tim Cornwell
1500	Polarization in Interferometry	Bill Cotton
1630	Discussion Groups	

Wednesday June 7.

0900 Imaging 2   Tim Cornwell
1030 Spectral Line 1 - Introduction   Eli Brinks
1200 Lunch
1330 Spectral Line 2 - Advanced   Juan Uson
1500 Spectral Line 3 - VLBI   Mark Claussen
1630 Discussion Groups

    Thursday, June 8.

0900 Limitations in Imaging   Rick Perley
1030 Mosaicing Techniques   Mark Holdaway
1115 mm-Wave Interferometry   TBA
1200 Lunch
1330 Solar Radio Interferometry   Tim Bastian
1415 Planetary Radio Interferometry   Bryan Butler
1530 Astrometry and Geodesy   Ed Fomalont
1630 Discussion Groups
1800 Summer School Dinner @ Macey Center

    Friday, June 9.

0900 Observational Strategies - VLA   Alan Bridle
1030 Observational Strategies - VLBA   Joan Wrobel
1145 Wrap-up   Rick Perley
1200 Lunch
1330 Data Tutorial (all afternoon)   various

    *** End of the Official Part of the Summer School ***

    Saturday, June 10.

    Outdoor Activities -- details to be announced.

    ****

    Lectures will be held in the Macey Center, located just south
of the Array Operations Center. There will be a question period, and
a short break each morning and afternoon, at about 10:15 and 14:45
respectively.

     The Discussion Groups shown in the schedule are intended to
allow interaction between attendees and local experts in a smaller,
more convivial setting. The number and subject of these groups will
be decided each afternoon by the organizers, based on what the day's
issues appear to be, as evidenced by questions, or lack of questions, or
comments made and overheard during the breaks. Various rooms in the
AOC (Array Operations Center) will be utilized for these groups.

    We will try to be as responsive as possible to the needs of
our visitors. If, during the Summer School, there is a subject that
is not understood, please contact any of the organizers, and we'll try
to directly clarify the point or organize a discussion group to
address the point.

    At this time, we still do not have the various datasets
prepared. It is hoped that these will be come available over the next
two weeks. We will notify all participants as soon as each one is
ready.

Please note that because Terry Romero will be taking some time off
(her daughter is getting married), replies to this current mailing,
and all queries about the summer school organization, should be directed
to Lori Appel:

      lappel@nrao.edu

Questions about the lecture content, or data tutorials, should be directed
to Rick Perley:

      rperley@nrao.edu

There will be one last e-mailing to all participants, approximately
one week before the summer school begins. This will contain the registration information, shuttle schedule, data tutorial
schedule, and the list of available activities on Saturday.

      Rick Perley

If you have not done so, please return this form to:

Lori Appel
NRAO
PO Box O, Socorro, NM 87801
E-Mail: lappel@nrao.edu
Fax: (505)835-7027

Please note: form returned is to a different E-Mail address than last time

Check one of   (   ) I will attend the 1995 NRAO Summer School.
      (   ) I will not attend the 1995 NRAO Summer School.

Initials and family name_____

Name and institution affiliation to appear on name tag:

_____

_____

Estimated transportation times from the Albuquerque Airport to Socorro
on June 4, 1995 are: (12:30 to 9:30 PM every 1.5 hours)
Please indicate if you will use this service.

I will_____   I will not_____   use the NRAO free transport.

ARRIVAL
I will arrive at the Albuquerque Airport on:

Date_____

Time _____AM   _____PM

Airline and Flight number_____

DEPARTURE
I will depart from the Albuquerque Airport on:

Date_____

Time _____AM _____PM

Airline and Flight number_____

I am interested in the Saturday tour of
_____VLA, _____VLBA (PieTown site), _____local hike

LODGING & MEALS:
Please reserve dormitory accommodation for me as follows:
( ) single room, no meals   ( ) single room and full campus meal ticket

( ) double room, no meals   ( ) double room and full campus meal ticket
Note: single rooms are limited in number. Some who request singles may be
assigned to a double room.
Please indicate gender _____Male _____Female

I request a double dormitory dormitory room and I want to share it with:
( ) a specific person - Name (   )
( ) any male   ( ) any female

I intend to stay in a motel and:
( ) I want a full campus meal ticket
( ) I will purchase some campus meals individually

Notice:
Participants are expected to have individual insurance coverage for health
and medical expenses for illnesses or injuries occurring during the event.

NM Tech is a state operated institution and carries only the necessary liability
coverage as required by the State of New Mexcio for any claims where NM
Tech is found to be negligent. AUI/NRAO carries limited liability coverage for
claims where AUI/NRAO is found be be negligent.

Information for those of you who want to stay in motels. Phone numbers are
included so you can make your reservations directly.

MOTEL-LOCATION-PHONE-RATE

EconoLodge	$36.00	1 Person
813 California St.	$42.00	2 People/1 Bed
(505)835-1500	$46.20	2 People/2 Beds
Economy Inn	$21.00	1 Person
400 California St.	$27.00	2 People/1 Bed
(505)835-4666	$33.00	2 People/2 Beds
Golden Manor	$35-40.00	1 Person

507 California	$35-40.00	2 People/1 Bed
(505)835-0230	$38.00	2 People/2 Beds
1-800-528-1234		

Motel 6	$24.99	1 Person
807 Highway 60	$30.99	2 People/2 Beds
(505)835-4300		

San Miguel	$37.00	1 Person
916 California St.	$44.00	2 People/1 Bed
(505)835-0211	$44.00	2 People/2 Beds

Super 8	$38.59	1 Person
1211 Frontage Rd.	$42.19	2 People/1 Bed
(505)835-4626	$44.89	2 People/2 Beds

Vagabond Motel	$28.60	1 Person
1009 California	$30.80	2 People/1 Bed
(505)835-0276	$33.80	2 People/2 Beds

Holiday Inn Express	$44.20	1-2 people (Govt. Rate)
(505)838-0556	$52.00	1-2 people

Note: Under construction, projected opening date is May 15, 1995

From: abridle (Alan Bridle)
To: Rick Perley <rperley@aoc.nrao.edu>
Subject: Re: SISS lectures
Date: Mon, 15 May 1995 09:33:31 -0400

Hi Rick,

Re the lecture style: I suggest we want a system that is

 (a) as simple as possible and
 (b) something that lecturers either know already, or may be be
     willing to learn because it it can be used elsewhere.

(a) probably asks for LaTeX (this is also needed if we will
convert to HTML later, and I definitiely want to try that)

(b) probably favors the AAS LaTeX package specifically (as it
can be used for electronic submission to AJ and ApJ, eliminating
proofreading). This gives people who don't know it already a
bit more incentive to learn it, and it is also fairly
well documented.

A few months back I converted my old lecture to LaTeX in order to test
the further conversion to HTML. The results were not quite as elegant
as using Fred's macros, but still pretty decent.

If everyone uses the same style, or close to it, it's also easier
for the editors to have a small change-of-mind and convert everything
automatically later. The real problem is if people use a lot of
their own macros and definitions that then have to be ferreted
out and checked for inconsistencies with other peoples'.

Hope this helps,

A.

From: fschwab@NRAO.EDU (Fred Schwab)
To: abridle@daphne.cv.nrao.edu (Alan Bridle)
Subject: template (fwd)
Date: Mon, 15 May 1995 17:14:30 -0400 (EDT)

Forwarded message:
>From fschwab Mon May 15 17:13:47 1995
Subject: template
To: rperley
Date: Mon, 15 May 1995 17:13:47 -0400 (EDT)
X-Mailer: ELM [version 2.4 PL23]
MIME-Version: 1.0
Content-Type: text/plain; charset=US-ASCII
Content-Transfer-Encoding: 7bit
Content-Length: 25284

Hi Rick,

    Tony suggested the AAS (LaTeX) preprint macro package. I just checked
in Socorro, and I see that the most up-to-date version (v. 3.0) is installed
in Socorro. It might be a reasonable choice. I'll append below two sample
files that come with this package. The first is a simple example. The
second is more complex. (Additional tables, containing the tex input to
generate the tables, I will not include. These sample files were not
available in the tex inputs area on zia. If you want to have a look at
all of it, ftp to "aas.org" and (in binary mode) retrieve the tar file
"pubs/aastex30.tar.Z".

    I would suggest this package only to contributors who are open to
suggestion and who do not know what form they would follow. To anyone
who is already comfortable with some other Plain TeX or LaTeX setup
(such as the ``plain'' document style of LaTeX) and who would prefer
to generate his or her course notes in the way in which he or she is
already accustomed, I would say to go ahead and do it that way. We
(or I) can change it to a conforming style.

    There is a standard macro package called ``psfig'' for including
figures. Some of the contributors to Tony's course notes used it. I
haeen't used it myself, but I understand from Tony that its use might
save us some labor. So anyone who would want to use it should go right
ahead.

    Remind the authors that it is good practice to include the full
titles of references in any kind of tutorial paper.

    I'll forward Alan a copy of this message, in case he has any comments.

                              - Fred

--------------------------- sample1.tex --------------------------------
% SAMPLE1.TEX -- AASTeX sample paper with minimal markup.

%\documentstyle[12pt,aasms]{article}
\documentstyle[11pt,aaspp]{article}

\begin{document}

\title{AAS\TeX\ Sample Papers. I. The Minimalist Approach}
\author{M. Headroom}
\affil{Industrial Metaphysics, Inc., Alluvia, HG 67555}

\begin{abstract}
This example illustrates how to use the AAS\TeX\ markup in a
way that is as unobtrusive as possible while still identifying
all the important structural parts of the paper.
The most salient thing to observe is that, apart from the document
style declaration, no formatting instructions are given in the file.
\end{abstract}

\keywords{Brevity --- models}

\section{Introduction}

Reader, this is my paper. Paper, this is our reader.

\section{Observations}

The observations upon which this paper is based were taken on Wednesday
while I was grocery shopping. I needed a half-gallon of milk, chips and
salsa, and a bag of kitty litter. Calibration data were taken on Friday
when I went back for a six-pack of beer.

\section{Discussion}

Grocery stores seem to be inordinately crowded on Wednesdays and Fridays
\markcite{(Headroom 1988)}. The increase in Friday-shopper density can
be understood by assuming that many people get paid on Fridays,
and by recognizing that such people often do not work on Saturdays and
Sundays and can be assumed to be ``stocking up'' for the weekend.

The Wednesday peak is harder to explain, but may be related to the
delivery of fresh produce on Tuesday nights. This interpretation
depends on the assumption that many people
eat sensibly and therefore find fresh produce attractive.

\acknowledgments

My cats, Hal and Yoda, provided motivation for the initiation of this study.

\begin{references}
\reference Berlioz, H. 1837, Grande Messe du Morts (Paris: Durand)
\reference Headroom, M. 1988, \apj, 278, 356
\end{references}

\end{document}

---------------------------- sample2.tex -----------------------
% SAMPLE2.TEX -- AASTeX macro package tutorial paper.

% The first item in a LaTeX file must be a \documentstyle command to
% declare the overall style of the paper. The two \documentstyle lines
% that are relevant for the AASTeX macros are shown; one is commented out
% so that the file can be processed.

%\documentstyle[12pt,aasms]{article}

```
\documentstyle[11pt,aaspp]{article}
%\documentstyle[aaspptwo]{article}

% There are two optional preamble declarations that enable to user to
% control certain formatting options.  \tighten is used with the
% aasms substyle to turn off double-spacing; don't do this for
% actual manuscripts intended for editorial review, only for your friends.
%
% \eqsecnum changes the way equations are numbered.  Normally,
% equations are just numbered sequentially through the entire paper.
% If \eqsecnum appears in the preamble, equation numbers will
% be sequential through each section, and will be formatted "(sec-eqn)",
% where sec is the current section number and eqn is the number of the
% equation within that section.  \eqsecnum can be used with
% either substyle.

%\tighten
%\eqsecnum

% Here's some slug-line data.  They're never printed out by these
% substyles because they're only relevant to the actual publication
% process, and these styles aren't used in publication (yet).
% The receipt and acceptance dates would be filled in by the editorial
% staff on the appropriate dates; they are commented out in this sample
% so that the abstract environment prints out rules so that the dates
% can be typed onto the manuscript according to current practice.

\received{4 August 1988}
%\accepted{23 September 1988}
\journalid{337}{15 January 1989}
\articleid{11}{14}

% This is the end of the "preamble".  Now we wish to start with the
% real material for the paper, which we indicate with \begin{document}.
% Following the \begin{document} command is the front matter for the
% paper, viz., the title, author and address data, the abstract, and
% any keywords or subject headings that are relevant.

\slugcomment{Not to appear in Nonlearned J., 45.}

\begin{document}

\title{Collapsed Cores in Globular Clusters,\\
    Gauge-Boson Couplings,\\
    and AAS\TeX\ Macro Sample}

\author{S. Djorgovski\altaffilmark{1,2,3} and Ivan R. King\altaffilmark{1}}
\affil{Astronomy Department, University of California,
    Berkeley, CA 94720}

\author{C. D. Biemesderfer\altaffilmark{4,5}}
\affil{National Optical Astronomy Observatories, Tucson, AZ 85719}

\and

\author{R. J. Hanisch\altaffilmark{5}}
\affil{Space Telescope Science Institute, Baltimore, MD 21218}
```

% Notice that each of these authors has alternate affiliations, which
% are identified by the \altaffilmark after each name. The actual alternate
% affiliation information is typeset in footnotes at the bottom of the
% first page, and the text itself is specified in \altaffiltext commands.
% There is a separate \altaffiltext for each alternate affiliation
% indicated above.

\altaffiltext{1}{Visiting Astronomer, Cerro Tololo Inter-American Observatory.
CTIO is operated by AURA, Inc.\ under contract to the National Science
Foundation.}
\altaffiltext{2}{Society of Fellows, Harvard University.}
\altaffiltext{3}{present address: Center for Astrophysics,
   60 Garden Street, Cambridge, MA 02138}
\altaffiltext{4}{Visiting Programmer, Space Telescope Science Institute}
\altaffiltext{5}{Patron, Alonso's Bar and Grill}

% The abstract environment prints out the receipt and acceptance dates
% if they are relevant for the journal style. For the aasms style, they
% will print out as horizontal rules for the editorial staff to type
% on, so long as the author does not include \received and \accepted
% commands. This should not be done, since \received and \accepted dates
% are not known to the author.

\begin{abstract}
This is a preliminary report on surface photometry of the major
fraction of known globular clusters, to see which of them show the signs
of a collapsed core.
We also show off the results of some recreational mathematics,
and give pause to consider the dangers of the too fertile mind.
\end{abstract}

\keywords{clusters: globular, peanut --- bosons: bozos}
%\keywords{globular clusters,peanut clusters,bosons,bozos}

% That's it for the front matter. On to the main body of the paper.
% We'll only put in tutorial remarks at the beginning of each section
% so you can see entire sections together.
%
% In the first two sections, you should notice the use of the LaTeX \cite
% command to identify citations. The citations are tied to the
% reference list via symbolic tags. We have chosen the first three
% characters of the first author's name plus the last two numeral of the
% year of poblication. The corresponding reference has a \bibitem
% command in the reference list below.
%
% Please go to the LaTeX manual for a complete description of the
% \cite-\bibitem mechanism.

\section{Introduction}

A focal problem today in the dynamics of globular clusters is
core collapse. It has been predicted by theory
for decades (\cite{hen61,lyn68,spi85}), but
observation has been less alert to the phenomenon. For many years the
central brightness peak in M15 (\cite{kin75,new78})
seemed a unique anomaly. Then Auri\`ere (1982) suggested a central peak
in NGC 6397, and a limited photographic survey of ours (\cite[Paper I]{djo84})
found three more cases, including NGC 6624, whose

sharp center had often been remarked on (e.g., \cite{can78}).

\section{Observations}

All our observations were short direct exposures with CCD's. At
Lick Observatory we used a TI 500$\times$500 chip
and a GEC 575$\times$385, on the 1-m Nickel reflector. The only
filter available at Lick was red. At CTIO we used a GEC 575$\times$385, with
$B, V,$ and R filters, and an RCA 512$\times$320, with $U, B, V, R,$ and I
filters, on the 1.5-m reflector. In the CTIO observations we tried to
concentrate on the shortest practicable wavelengths; but faintness, reddening,
and poor short-wavelength sensitivity often kept us from observing in U or
even in B. All four cameras had scales of the order of 0.4 arcsec/pixel, and
our field sizes were around 3 arcmin.

The CCD images are unfortunately not always suitable, for very poor
clusters or for clusters with large cores. Since the latter are easily
studied by other means, we augmented our own CCD profiles by collecting
from the literature a number of star-count
profiles (\cite{kin68,pet76,har84,ort85}),
as well as photoelectric profiles (\cite{kin66}) and
electronographic profiles (\cite{kro84}).
In a few cases we judged normality by eye estimates on one of the Sky
Surveys.

% In this section, we see the use of the \subsection command to set off
% an independent subsection. We only have one here; usually there would
% be several.
%
% We show the use of several of the displayed math environments described
% in the User Guide, and you get a healthy dose of mathematical typesetting
% examples. Also, observe the use of the LaTeX \label command after the
% \subsection to give a symbolic tag to the subsection for cross-referencing
% in a \ref command. LaTeX automatically numbers the sections, equations,
% tables, etc. as it goes, so in general you don't know what number something
% is going to have. We'll refer to the "hairymath" section a little later.

\section{Helicity Amplitudes}

It has been realized that helicity amplitudes provide a convenient means
for Feynman diagram\footnote{Footnotes can be inserted like this.}
evaluations. These amplitude-level techniques
are particularly convenient for calculations involving many Feynman
diagrams, where the usual trace techniques for the amplitude
squared becomes unwieldy. Our calculations use the helicity techniques
developed by other authors (\cite{hag86}); we briefly summarize below.

\subsection{Formalism} \label{hairymath}

A tree-level amplitude in e^+e^- collisions can be expressed in
terms of fermion strings of the form
\begin{equation}
\bar v(p_2,\sigma_2)P_{-\tau}\not\!a_1\not\!a_2\cdots
\not\!a_\nu(p_1,\sigma_1)\;,
\end{equation}
where p and σ label the initial $e^{\pm}$ four-momenta
and helicities $(\sigma = \pm 1)$, $\not\!a_i=a^\mu_i\gamma_\nu$
and $P_\tau=\frac{1}{2}(1+\tau\gamma_5)$ is a chirality projection

operator $(\tau = \pm1)$. The a^μ_i may be formed from particle
four-momenta, gauge-boson polarization vectors or fermion strings with
an uncontracted Lorentz index associated with final-state fermions.

In the chiral representation the γ matrices are expressed
in terms of 2×2 Pauli matrices σ and the unit matrix 1 as
\begin{mathletters}
\begin{eqnarray}
\gamma^\mu \: & = &
\: \left(
\begin{array}{cc}
0 & \sigma^\mu_+ \\
\sigma^\mu_- & 0
\end{array} \; \; \right)\;,
\;\gamma^5= \left(
\begin{array}{cc}
-1 & \; 0\\
0 & \; 1
\end{array} \; \; \right) \;, \nonumber \\ & & \\
\sigma^\mu_{\pm} \:& = & \: ({\bf 1} ,\pm \sigma)\;, \nonumber
\end{eqnarray}
\end{mathletters}
giving
\begin{equation}
\not\!a= \left(
\begin{array}{cc}
0 & (\not\!a)_+\\
(\not\!a)_- & 0
\end{array}\right),\;(\not\!a)_\pm=a_\mu\sigma^\mu_\pm\;,
\end{equation}
The spinors are expressed in terms of two-component Weyl spinors as
\begin{equation}
u=\left(
\begin{array}{c}
(u)_-\\
(u)_+
\end{array}\right),\;v={\bf (}(v)^\dagger_+{\bf ,} \; (v)^\dagger_-{\bf)}\;.
\eqnum{3A}
\end{equation}
The Weyl spinors are given in terms of helicity eigenstates
$\chi_\lambda(p)$ with $\lambda=\pm1$ by
\begin{eqnarray}
u(p,\lambda)_\pm & = & (E\pm\lambda|{\bf p}|)^{1/2}\chi_\lambda(p)\;,
\nonumber \\ & & \\
v(p,\lambda)_\pm & = & \pm\lambda(E\mp\lambda|{\bf p}|)^{1/2}\chi
_{-\lambda}(p) \nonumber
\end{eqnarray}

% In these sections, we see some additional math-related markup, and we
% have references to one of the tables (occurs later in the document)
% and the "hairymath" section immediately preceding this one.
%
% In the second paragraph, note the use of in-text math ($stuff$) including
% a couple of the miscellaneous symbol commands defined in the AASTeX macro
% package.
%
% This is the last section of the paper, so there is an \acknowledgments
% section at the end of the main body.

\section{Floating material and so forth}

Consider a task that computes profile parameters for a modified
Lorentzian of the form
\begin{equation}
I = \frac{1}{1 + d_{1}^{P (1 + d_{2})}}
\end{equation}
where
\begin{displaymath}
d_{1} = \sqrt{ \left(\begin{array}{c} \frac{x_{1}}{R_{maj}}
\end{array} \right) ^{2} +
\left(\begin{array}{c} \frac{y_{1}}{R_{min}} \end{array} \right) ^{2} }
\end{displaymath}
\begin{displaymath}
d_{2} = \sqrt{ \left(\begin{array}{c} \frac{x_{1}}{P R_{maj}}
\end{array} \right) ^{2} +
\left(\begin{array}{c} \case{y_{1}}{P R_{min}} \end{array} \right) ^{2} }
\end{displaymath}
\[x_{1} = (x - x_{0}) \cos \Theta + (y - y_{0}) \sin \Theta \]
\[y_{1} = -(x - x_{0}) \sin \Theta + (y - y_{0}) \cos \Theta \]

In these expressions x_{0},y_{0} is the star center, and Θ is the
angle with the x axis. Results of this task are shown in table~\ref{tbl-1}.
It is not clear how these sorts of analyses may affect determination of
$M_{\sun}$ and $M_{\earth}$, but the assumption is that the alternate results
should be less than 90\deg\ out of phase with previous values.
We have no observations of \ion{Ca}{2}.
Roughly \slantfrac{4}{5} of the electronically submitted abstracts
for AAS meetings are error-free.

\acknowledgments

We are grateful to V. Barger, T. Han, and R. J. N. Phillips for
doing the math in section~\ref{hairymath}.

\appendix
\section{Floating material and so forth}

Consider a task that computes profile parameters for a modified
Lorentzian of the form
\begin{equation}
I = \frac{1}{1 + d_{1}^{P (1 + d_{2})}}
\end{equation}
where
\begin{mathletters}
\begin{displaymath}
d_{1} = \frac{3}{4} \sqrt{ \left(\begin{array}{c} \frac{x_{1}}{R_{maj}}
\end{array} \right) ^{2} +
\left(\begin{array}{c} \frac{y_{1}}{R_{min}} \end{array} \right) ^{2} }
\end{displaymath}
\begin{equation}
d_{2} = \case{3}{4} \sqrt{ \left(\begin{array}{c} \frac{x_{1}}{P R_{maj}}
\end{array} \right) ^{2} +
\left(\begin{array}{c} \case{y_{1}}{P R_{min}} \end{array} \right) ^{2} }
\end{equation}
\begin{eqnarray}
x_{1} & = & (x - x_{0}) \cos \Theta + (y - y_{0}) \sin \Theta\\

```
y_{1} & = & -(x - x_{0}) \sin \Theta + (y - y_{0}) \cos \Theta
\end{eqnarray}
\end{mathletters}

For completeness, here is one last equation.
\begin{equation}
e = mc^2
\end{equation}

% That's the end of the main body of the paper.  Now we will have some
% back matter.
%
% Tables are usually supposed to be submitted one per page, following
% the main body of the text, so before each table we would have a
% \clearpage to force a page break at that point.  There should also
% be a \clearpage after the last table so that it gets forced onto
% its own page, too.
%
% The tabular data is aligned within the "tabular" environment.  Observe
% that our tabular environment is embedded within a "center" environment,
% which is in turn inside a "table" environment.  Exercise for the reader:
% Why do you think we used the "table*" environment?
%
% We need the table environment for autonumbering and caption generation,
% which is why it is not enough to have a centered tabular.
%
% Within the tabular environment, please note that we use no vertical
% rules, and the only horizontal rule is the \tableline (*not* an \hline)
% which delimits the column headings from the tabular data.  Also note
% that a couple of the column headings require special annotation, i.e.,
% footnotes for tables.  They are marked and tagged with \tablenotemark.
% \tablenotemarks could be placed on individual data entries as well,
% but be careful not to go berserk doing this.

\clearpage

\begin{table*}
\begin{center}
\begin{tabular}{crrrrrrrrrr}
Star & Height & $d_{x}$ & $d_{y}$ & $n$ & $\chi^2$ & $R_{maj}$ & $R_{min}$ &
\multicolumn{1}{c}{$P$\tablenotemark{a}} & $P R_{maj}$ & $P R_{min}$ &
\multicolumn{1}{c}{$\Theta$\tablenotemark{b}} \\
\tableline
1 &33472.5 &-0.1 &0.4  &53 &27.4 &2.065  &1.940 &3.900 &68.3 &116.2 &-27.639\\
2 &27802.4 &-0.3 &-0.2 &60 &3.7  &1.628  &1.510 &2.156 &6.8  &7.5 &-26.764\\
3 &29210.6 &0.9  &0.3  &60 &3.4  &1.622  &1.551 &2.159 &6.7  &7.3 &-40.272\\
4 &32733.8 &-1.2 &-0.5 &41 &54.8 &2.282  &2.156 &4.313 &117.4 &78.2 &-35.847\\
5 & 9607.4 &-0.4 &-0.4 &60 &1.4  &1.669  &1.574 &2.343 &8.0  &8.9 &-33.417\\
6 &31638.6 &1.6  &0.1  &39 &315.2 & 3.433 &3.075 &7.488 &92.1 &25.3 &-12.052\\
\end{tabular}
\end{center}

% Text for table footnotes must follow the tabular environment but must
% be inside the table environment.  Note that it is OK to put \ref's
% in \tablenotetext's.

\tablenotetext{a}{Sample footnote for table~\ref{tbl-1}}
\tablenotetext{b}{Another sample footnote for table~\ref{tbl-1}}
```

```
\tablenotetext{c}{Footnote with no call out}
\tablenotetext{d}{Another footnote with no call out}
\tablenotetext{e}{A further additional footnote with no call out}

% The caption contains only the caption text.  The "Table N." identification
% is generated by the \caption command on its own.
%
% It is necessary to \label tables and figures *after* the \caption has been
% specified because the table/figure number is generated by \caption, not
% by \begin{whatever}.

\caption{Terribly relevant tabular information.} \label{tbl-1}

\end{table*}

\begin{table*}
\begin{center}
\begin{tabular}{crrrrrrrrrr}
Star & Height & $d_{x}$ & $d_{y}$ & $n$ & $\chi^2$ & $R_{maj}$ & $R_{min}$ &
\multicolumn{1}{c}{$P$\tablenotemark{t}} & $P R_{maj}$ & $P R_{min}$ &
\multicolumn{1}{c}{$\Theta$\tablenotemark{u}} \\
\tableline
1 &33472.5 &-0.1 &0.4  &53 &27.4 &2.065  &1.940 &3.900 &68.3 &116.2 &-27.639\\
2 &27802.4 &-0.3 &-0.2 &60 &3.7  &1.628  &1.510 &2.156 &6.8  &7.5 &-26.764\\
3 &29210.6 &0.9  &0.3  &60 &3.4  &1.622  &1.551 &2.159 &6.7  &7.3 &-40.272\\
4 &32733.8 &-1.2\tablenotemark{v} &-0.5 &41 &54.8 &2.282  &2.156 &4.313 &117.4 &78.2 &-35.847\\
5 & 9607.4 &-0.4 &-0.4 &60 &1.4  &1.669\tablenotemark{v}  &1.574 &2.343 &8.0  &8.9 &-33.417\\
6 &31638.6 &1.6  &0.1  &39 &315.2 & 3.433 &3.075 &7.488 &92.1 &25.3 &-12.052\\
\end{tabular}
\end{center}

% Text for table footnotes must follow the tabular environment but must
% be inside the table environment.  Note that it is OK to put \ref's
% in \tablenotetext's.

\tablenotetext{t}{Sample footnote for table~\ref{tbl-2}}
\tablenotetext{v}{Yet another sample footnote for table~\ref{tbl-2}}
\tablenotetext{u}{Another sample footnote for table~\ref{tbl-2}}

% The caption contains only the caption text.  The "Table N." identification
% is generated by the \caption command on its own.
%
% It is necessary to \label tables and figures *after* the \caption has been
% specified because the table/figure number is generated by \caption, not
% by \begin{whatever}.

\tablenum{1A}
\caption{
More terribly relevant tabular information.  Notice that it is possible
to have more than one table on a page where each can have associated
independent notes.  We extend the caption with
further pointless drivel to see the effects of lengthy text on
caption formatting.} \label{tbl-2}

\tablecomments{We can also attach a long-ish paragraph of explanatory
material to a table.  This would be done for journals where long
captions are not permitted (usually because the caption is regarded
as the table's title).  A different command would be used if the
```

paragraph contained a list of references for the table.}

\end{table*}

\include{samp2tbl}

% This is the last table for this paper (as well as the first), so we
% should follow it with a \clearpage. In order to force all the floating
% tables out of their buffers and onto vertical page lists, we must use
% \clearpage rather than \newpage.

\clearpage

% Now comes the reference list. In this document, we used \cite to call
% out citations, so we must use \bibitem in the reference list, which
% means we use the LaTeX thebibliography environment. Please note that
% \begin{thebibliography} is followed by a null argument. If you forget
% this, mayhem ensues, and LaTeX will say "Perhaps a missing item?" when
% you run it. Do not call us, do not send mail when this happens. Put
% the silly {} after the \begin{thebibliography}.
%
% Each reference has a \bibitem command to define the citation format
% and the symbolic tag, as well as a \reference command which sets up
% formatting parameters for the reference list itself.
%
% If we had not bothered with the \cite-\bibitem business, calling out
% the references outselves, the reference list could be enclosed in
% a references environment (\begin{references} has no null argument),
% and there would be no need for the leading \bibitem's.

\begin{thebibliography}{}
\bibitem[Auri\`ere 1982]{aur82} \reference Auri\`ere, M. 1982, \astap,
    109, 301
\bibitem[Canizares et al.\ 1978]{can78} \reference Canizares, C. R.,
    Grindlay, J. E., Hiltner, W. A., Liller, W., and
    McClintock, J. E. 1978, \apj, 224, 39
\bibitem[Djorgovski and King 1984]{djo84} \reference Djorgovski, S.,
    and King, I. R. 1984, \apjlett, 277, L49
\bibitem[Hagiwara and Zeppenfeld 1986]{hag86} \reference Hagiwara, K., and
    Zeppenfeld, D. 1986, Nucl.Phys., 274, 1
\bibitem[Harris and van den Bergh 1984]{har84} \reference Harris, W. E.,
    and van den Bergh, S. 1984, \aj, 89, 1816
\bibitem[H\`enon 1961]{hen61} \reference H\'enon, M. 1961, Ann.d'Ap., 24, 369
\bibitem[King 1966]{kin66} \reference King, I. R. 1966, \aj, 71, 276
\bibitem[King 1975]{kin75} \reference King, I. R. 1975, Dynamics of
    Stellar Systems, A. Hayli, Dordrecht: Reidel, 1975, 99
\bibitem[King et al.,\ 1968]{kin68} \reference King, I. R., Hedemann, E.,
    Hodge, S. M., and White, R. E. 1968, \aj, 73, 456
\bibitem[Kron et al.,\ 1984]{kro84} \reference Kron, G. E., Hewitt, A. V.,
    and Wasserman, L. H. 1984, \pasp, 96, 198
\bibitem[Lynden-Bell and Wood 1968]{lyn68} \reference Lynden-Bell, D.,
    and Wood, R. 1968, \mnras, 138, 495
\bibitem[Newell and O'Neil 1978]{new78} \reference Newell, E. B.,
    and O'Neil, E. J. 1978, \apjsupp, 37, 27
\bibitem[Ortolani et al.,\ 1985]{ort85} \reference Ortolani, S., Rosino, L.,
    and Sandage, A. 1985, \aj, 90, 473
\bibitem[Peterson 1976]{pet76} \reference Peterson, C. J. 1976, \aj, 81, 617
\bibitem[Spitzer 1985]{spi85} \reference Spitzer, L. 1985, Dynamics of

Star Clusters, J. Goodman and P. Hut, Dordrecht: Reidel, 109
\end{thebibliography}

% Finally, we have figure captions. Usually these must be on a separate
% page, although unlike table, it is often permissible to have several
% figure captions on the same page. We force the page break between
% the reference list and the figure captions.
%
% The \caption command in the figure environment works like the one in the
% table environment (it's the same one, actually), except that this one
% produces identification text that reads "Figure N."

\clearpage

\begin{figure}
\plotone{sgi9259.eps}
\caption{We use the \LaTeX\ {\tt figure} environment syntax to set this
figure caption.}
\end{figure}

% That's all, folks.
%
% The technique of segregating major semantic components of the document
% within "environments" is a very good one, but you as an author have to
% come up with a way of making sure each \begin{whatzit} has a corresponding
% \end{whatzit}. If you miss one, LaTeX will probably complain a great
% deal during the composition of the document. Occasionally, you get away
% with it right up to the \end{document}, in which case, you will see
% "\begin{whatzit} ended by \end{document}".

\end{document}

From: Rick Perley <rperley@aoc.nrao.edu>
To: abridle
Subject: Summer School
Date: Mon, 22 May 1995 14:09:02 -0600

Hi Alan. Did you peruse Fred's suggestions concerning using the AAS
LaTeX macro package? Seems sensible to me.

Terry and I are going to meet shortly about logistical things. AFter
that, I'm going to look for a time for the lectures to have a phone meeting.
I want to receive an outline from everybody by Thursday, so as to ensure there
are no serious overlaps in coverage, or gaps. Also to get people started on
what they are supposed to do. I would like to circulate these summaries, so
all the lecturers can make their suggestions to each other about what is
missing, what is inappropriate, etc.

Then, I'd like to set a date next week, probably 31 May, to have all
xxx.tex files ready, so we can get them reproduced in time for the summer
school.

Any thoughts on these matters?

Rick

P.S. Been really hectic here, damn survey is drowning me. I was 13 days
behind, then had my DAT die (twice), and one of my disks die. Sigh. But we're
all caught up now, just in time.

From: abridle (Alan Bridle)
To: rperley
Subject: forwarded message from Alan Bridle
Date: Mon, 22 May 1995 16:14:44 -0400

------- start of forwarded message (RFC 934 encapsulation) -------
Received: by polaris.cv.nrao.edu (AIX 3.2/UCB 5.64/4.03)
        id AA38043; Mon, 15 May 1995 09:33:31 -0400
Message-Id: <9505151333.AA38043@polaris.cv.nrao.edu>
In-Reply-To: <199505111459.AA03114@sechelt.aoc.nrao.edu>
References: <199505111459.AA03114@sechelt.aoc.nrao.edu>
From: abridle (Alan Bridle)
To: Rick Perley <rperley@aoc.nrao.edu>
Subject: Re: SISS lectures
Date: Mon, 15 May 1995 09:33:31 -0400

Hi Rick,

Re the lecture style: I suggest we want a system that is

 (a) as simple as possible and
 (b) something that lecturers either know already, or may be be
     willing to learn because it it can be used elsewhere.

(a) probably asks for LaTeX (this is also needed if we will
convert to HTML later, and I definitiely want to try that)

(b) probably favors the AAS LaTeX package specifically (as it
can be used for electronic submission to AJ and ApJ, eliminating
proofreading). This gives people who don't know it already a
bit more incentive to learn it, and it is also fairly
well documented.

A few months back I converted my old lecture to LaTeX in order to test
the further conversion to HTML. The results were not quite as elegant
as using Fred's macros, but still pretty decent.

If everyone uses the same style, or close to it, it's also easier
for the editors to have a small change-of-mind and convert everything
automatically later. The real problem is if people use a lot of
their own macros and definitions that then have to be ferreted
out and checked for inconsistencies with other peoples'.

Hope this helps,

A.

------- end -------

From: abridle (Alan Bridle)
To: Rick Perley <rperley@aoc.nrao.edu>
Subject: Re: Summer School
Date: Mon, 22 May 1995 16:26:31 -0400

Rick,

I just re-sent my comments on the macros, which you may have missed,
I did actually reply to that before Fred.

Re phone meeting, I'll not be in the office after this Thursday (25th).
I will be leaving for Socorro first thing on Tuesday, 30th May and
will arrive on Thursday 1st June (late).

I am working on new .ps and .tex for the lecture right now.

A.

From: Rick Perley <rperley@aoc.nrao.edu>
To: abridle@polaris.cv.nrao.edu
Subject: Re: forwarded message from Alan Bridle
Date: Mon, 22 May 1995 14:30:12 -0600

    Alan:

    I had already reviewed your forwarded message. The question I was asking (which I suppose you have answered) is whether to permit Fred's statement about using any other package which lecturers are familiar with. It seems that to minimize future effort, we should stick with the AAS LaTeX package.

    Rick

From: Rick Perley <rperley@aoc.nrao.edu>
To: abridle@polaris.cv.nrao.edu
Subject: Re: Summer School
Date: Mon, 22 May 1995 14:43:47 -0600

     Alan:

     What about a teleconference meeting on Thursday afternoon? I think it
may be best for me to circulate, this afternoon, the format statement, and
ask for outlines to be delivered to me by Wednesday evening. I'll then turn
these around and redistribute them to everyone, in time for a general meeting
on Thursday.

     Tim C. has just realized he hasn't enough time to get his three lectures
written by a week Wednesday. He's walking around, mumbling unprintable words
right now. Then, both Juan and Elias are away, and have been away for over
a week. Sounds like a last-minute struggle, again.

     Rick

P.S. But the data tutorials are going to be a big success -- one is already
checked into the ftp area (on zia), another should be there today, and mine
should make it by Wednesday.

From: abridle (Alan Bridle)
To: Rick Perley <rperley@aoc.nrao.edu>
Subject: Re: forwarded message from Alan Bridle
Date: Mon, 22 May 1995 16:45:44 -0400

Rick Perley writes:
>
>   I had already reviewed your forwarded message. The question I was
> asking (which I suppose you have answered) is whether to permit Fred's
> statement about using any other package which lecturers are familiar with.
> It seems that to minimize future effort, we should stick with the AAS LaTeX
> package.
>

There will doubtless be a tradeoff at the last minute between
having lectures at all and having them in the AAS package. This
may force the issue in the direction that Fred indicated.
Other things being equal, the AAS package is to be preferred,
however.

A.

From: abridle (Alan Bridle)
To: Rick Perley <rperley@aoc.nrao.edu>
Subject: Re: Summer School
Date: Mon, 22 May 1995 16:55:24 -0400

Thursday afternoon is fine by me for a telecon.

A.

From: Rick Perley <rperley@aoc.nrao.edu>
To: tbastian, tbeasley, ebrinks, bbutler, mclaussen, tcornwell, pdiamond,
    efomalont, mholdaway, pnapier, tromero, juson, gvanmoor, cwalker,
    jwrobel, ldaddari, bcotton, abridle
Subject: Upcoming Deadlines....
Date: Mon, 22 May 1995 15:50:45 -0600

Dear Lectures and Data Tutorialists:

We are fast approaching the Summer School, and it is time to make some
decisions on timescales and formats, and to set up some meetings and deadlines.

1) Notes Formats

After consultation with Alan and Tim, we have decided to require all
lecture notes be written under the AAS LaTeX preprint package. This is
available in both Charlottesville and Socorro, and is very easy to use.   If
you cannot locate a copy, you'll find two example templates in my area:
       /arana/u/rperley/siss
called: sample1.tex and sample2.tex. The former is really 'bare-bones', and
requires no LaTeX expertise whatever, the latter is considerably more
sophisticated, but includes ample notes to assist the relatively novice user.
       True traditionalists among you who cannot accept this format can take
advantage of a remarkable offer by Fred Schwab -- to modify whatever TeX form
your lecture might be in into a conforming style.

2) Notes Deadlines

Although the lectures themselves are following the pattern set by
the previous 3 summer schools, many of the lecturers are new. We naturally
expect that individuals will want to deviate at times from the old, well-worn
course. This is encouraged. However, to prevent serious overlap, and, even
worse, large gaps, it will be very useful for all lecturers to know what
other lecturers intend to cover well before lectures are given. To enable
this, I have decided to ask for the following:
       a) An outline of each lecture to be delivered (via e-mail) to me by
Wednesday evening (that's THIS Wednesday, May 24). Note that this is ONLY an
outline , perhaps two pages of brief notes. I intend to concatenate all these,
and distribute them to all of you by Thursday morning.
       b) A teleconference meeting for Thursday afternoon, 1PM MDT, to discuss
overlap, resolve outstanding issues, and ask for general input and questions.
       c) In order to have the lectures ready in printed form before the
summer school actually begins, I want a 'semi-final' lecture, ready for printing
(in the AAS LaTeX package, please) by Wednesday, next week (31 May). This
need not be a `final' version. It should be a fairly detailed set of notes
which parallels the lecture you will be giving. Its purpose is to give the
students a fairly clear idea of the material to be covered, and to permit them
to make marginal notes as you give your lecture.

3) Data Tutorials.

These are progressing fairly well. One is already installed in a
special ftp area on ZIA, one should be ready today, one (mine) should be ready
tomorrow. By Wednesday, I intend to e-mail all the participants about the
existence of these.

Rick

From: Rick Perley <rperley@aoc.nrao.edu>
To: abridle@polaris.cv.nrao.edu
Subject: Re: Upcoming Deadlines....
Date: Tue, 23 May 1995 09:47:41 -0600

Alan:

I'd defer a final version until you get here. Only Joan at this end
has even *begun* to organize their lectures. There is no hope whatever of
having all lectures integrated in any way this week, and probably no hope
even by the end of next week.

In fact, 4 of the lecturers located here in Socorro haven't been seen
by me for at least a week. (Uson, Holdaway, Brinks, Bastian).

Rick

24 May 1995

Dear Summer School Participant:

An innovation for this year's edition of the Synthesis Imaging
Summer School is the preparation of data tutorials, representing
different areas of interferometric calibration and imaging. Four
different tutorials are planned: (a) VLA polarimetric, with multiple
configurations, (b) VLA spectral line, (c) VLBA 'continuum', and (d)
VLBA spectral line.

The data for three of these are now available. Two of these
have 'README' files also available, which contain brief instructions
for calibration and editing.

The current status is summarized below:

1) VLA Continuum. Data available, README file under development.
2) VLA Spectral Line. Data and README available.
3) VLBA Continuum.   Data and README available.
4) VLBA Spectral Line. Not available yet.

An early version of the VLA Continuum README will shortly appear.

To obtain these files, follow these steps:

1) ftp to 'ftp.aoc.nrao.edu'
2) Login as 'anonymous', password is your e'mail address.
3) cd to /pub/summer_school.
4) A 'ls' will display the contents of this area. The names
       are (hopefully) self-explanatory.
5) Set the binary switch on (type 'binary').
6) Copy the files you wish (type 'get <filename>').
7) bye

Be sure to read the '.README' files first!

The authors of these tutorials will appreciate feedback if any significant problems are encountered. These people are:

1) VLA Continuum - Rick Perley (rperley@nrao.edu)
2) VLA Spectral Line - Gustaaf van Moorsel (gvanmoor@nrao.edu)
3) VLBA Continuum - Phil Diamond (pdiamond@nrao.edu).

Rick Perley

From: abridle (Alan Bridle)
To: tbeasley, rperley
Subject: Time-average smearing
Date: Thu, 25 May 1995 09:53:35 -0400

Tony,

Re the summer school outlines:

I notice that you propose to cover bandwidth smearing in lecture 2 but
not time-average smearing. Would you reconsider this and discuss
time-average smearing as well? It has been useful for VLA continuum
observers to see the comparison between the two effects that was
covered in Dick Thompson's lecture, and to understand that they would
be orthogonal for a polar field. Dick's analogy for estimating the
relative magnitudes of the effects is quite useful for a full-synthesis
image, and it helps people beginners think about the relationships between
sampling in the u-v plane and image defects.

I believe it will be even more important to have an elementary,
intuitive discussion of both effects in these lectures as the "Lecture
13" from the ASP volume will not be given. The obvious place for this
elementary treatment is in Lecture 2, where it was done originally.

A.

From: abridle (Alan Bridle)
To: jwrobel
Subject: Summer school outlines
Date: Thu, 25 May 1995 10:05:25 -0400

Hi Joan,

Not surprisingly as we have both given the one-and-only
"strategy" lecture at these schools before, there is some
similarity between our plans for lectures 18 and 19
this time. It rarely hurts to say things twice, but maybe
we should check ourselves for over-duplication?
Possibly this means that you can go rather quickly over a
few topics in your lecture (provided I haven't screwed them up
while giving mine) in favor of emphasizing the differences,
where they exist, between VLB and VLA?

I'll be in town on the weekend before the Summer School so
we will have a chance to talk about this before the
deluge hits .....

Cheers,

A.

From: Rick Perley <rperley@aoc.nrao.edu>
To: abridle@polaris.cv.nrao.edu, tbeasley
Subject: Re: Time-average smearing
Date: Thu, 25 May 1995 08:19:38 -0600

Alan:

I'll be covering both types. But I agree that Tony should mention
both as well.

Rick

From: abridle (Alan Bridle)
To: rperley
Subject: notation and LAS
Date: Thu, 25 May 1995 11:29:19 -0400

Rick,

I notice that in the Observational Status Report, Table 3, you have
introduced a notation \theta_{Max} for the largest angular structure,
which we consistently called \theta_{LAS} in the Summer Schools since
1983. This is unfortunate, as there has also been a θ_{max}
(lower case m} in my lectures specifying the size of the field of
siew.

This \theta_LAS-Max-max is bound to confuse people. Can I persuade
you to go back to using \theta_{LAS} in the Status report, to make it
consistent with our published SIRA?

Also, again attempting to achieve some consistency, my lecture always
used the snapshot values of \theta_{LAS} from Carl Bignell's
Obs. Status report in _my_ Table 3. These values are about 0,8 of
those you are giving now in the Observational Status Report, which are
for a fhll synthesis. You recommend using 0.5 of your values for a
snapshot. Unfortunately neither you or Carl said what criterion had
been used for judging this. I'd like to continue making the table in
my lecture compatible with the Status report (apart from your
notational deviation above) so I will change my values. But it would
help to state the criterion. What was yours, and why did it change
from carl's?

Thanks,

A.

From: Rick Perley <rperley@aoc.nrao.edu>
To: abridle@polaris.cv.nrao.edu
Subject: Re: notation and LAS
Date: Thu, 25 May 1995 10:36:51 -0600

Alan:

1) Of course we can change it. I don't recall the origin of that
particular notation -- it might have crept in when Tim made the conversion to
LaTeX, when I was on sabbatical.

2) Criterion for the difference in LAS from extended integration vs.
snapshot? Just experience and a rough guess. I probably consulted with Tim
and Ron. That was a *long* time ago! There is no hard edge, of course. So
it is most important to be consistent, and then to explain approximately the
fraction (0.5 in this case). I certainly believe that 0.8 is too optimistic,
and probably ratcheted it down. 0.5 might be too low!

Rick

From: abridle (Alan Bridle)
To: Rick Perley <rperley@aoc.nrao.edu>
Subject: Re: notation and LAS
Date: Thu, 25 May 1995 13:18:04 -0400

Rick Perley writes:
>
>   2) Criterion for the difference in LAS from extended integration vs.
> snapshot?

No, I think that probably factor of two is about right, it's the criterion for
when a scale is "poorly imaged" in either mode that I was getting at.
This was never stated in the manual.

A.

From: Rick Perley <rperley@aoc.nrao.edu>
To: abridle, bbutler, bcotton, cwalker, ebrinks, efomalont, gvanmoor,
    jc@astro.caltech.edu, juson, jwrobel, ldaddari, mclaussen, mholdaway,
    pdiamond, pnapier, tbastian, tbeasley, tcornwell, tromero
Subject: Revised SChedule
Date: Thu, 25 May 1995 14:14:58 -0600

The final order between Fomalont/Walker is still not finalized.

The NRAO Synthesis Imaging Summer School Lecture Schedule

v 2.0 25 May 1995
June 5 - 9 1995. Socorro, N.M.

Monday, June 5.

Time	Title	Lecturer
0830	Opening Welcome	Rick Perley
0900	Coherence in Radio Astronomy	Juan Uson
1030	Antennas in Radio Astronomy	Peter Napier
1200	Lunch	
1330	Elements of Interferometry	Tony Beasley
1500	Correlators and Sensitivity	Larry D'Addario
1630	Discussion Groups	various

Tuesday, June 6.

0900	Propagation Effects	Ed Fomalont
1030	Calibration/Editing	Craig Walker
1200	Lunch	
1330	Polarization in Interferometry	Bill Cotton
1500	Imaging 1	Tim Cornwell
1630	Discussion Groups	

Wednesday June 7.

0900	Imaging 2	Tim Cornwell
1030	Limitations in Imaging	Rick Perley
1200	Lunch	
1330	Spectral Line 1 - introduction	Elie Brinks
1500	Spectral Line 2 - Advanced	Juan Uson
1630	Discussion Groups	

Thursday, June 8.

0900	Spectral Line 3 - VLBI	Mark Claussen
1030	Mosaicing Techniques	Mark Holdaway
1115	mm-Wave Interferometry	John Carlstrom
1200	Lunch	
1330	Solar Radio Interferometry	Tim Bastian
1415	Planetary Radio Interferometry	Bryan Butler
1530	Astrometry and Geodesy	Ed Fomalont
1630	Discussion Groups	
1800	Summer School Dinner @ Macey Center	

Friday, June 9.

```
0900  Observational Strategies - VLA       Alan Bridle
1030  Observational Strategies - VLBA      Joan Wrobel
1145  Wrap-up                    Rick Perley
1200  Lunch
1330  Data Tutorial  (all afternoon)    various
```

*** End of the Official Part of the Summer School ***

Saturday, June 10.

Outdoor Activities -- details to be announced.

Here is the promised outline. Note that no resolution of the Fomalont/Walker order has been made.

Topic Outlines for NRAO Synthesis Imaging Summer School.

Version 2.0
May 24 1995

1. 9:00 AM Monday   Coherence. --   USON

Introduction

The observed field

Spatial coherence of the observed field

The Fourier transform: a few simple properties

Synthesis imaging: inversion of the coherence function

Spectroscopy and polarimetry

_____

2. 10:30 AM Monday   Elements of Radio Interferometry --   BEASLEY

I propose to cover the following areas in my "Basic
        Interferometry" Lecture.

1) History of radio telescope resolutions

2) A single antenna as an adding interferometer

3) The RF correlating interferometer, including
-- definition of visibility
-- def'n of spatial frequencies u,v,w
-- derivation of 2-D relationship between Visibility and Brightness

4) Effects of Bandwidth and Time Averaging -- delay pattern;
        "RF delay-tracking
        interferometer"

5) Frequency conversion

6) Fringe rotation + (introductory) complex correlators

7) simple coordinate systems (VLA/VLBI/E-W types)

8) Optimal array configurations - criteria and examples

I'm assuming.......

a) Mututal coherence done
b) Fourier theory done
c) Single antennas (a la Napier) done

_____

3. 1:30 PM Monday.   Antennas in Radio Astronomy   NAPIER

      Essentially unchanged from the book version

_____

4. 3:00 PM MOnday   Correlators and Sensitivity   D'ADDARIO

   1. Cross correlators in general -- single baseline

      . The elementary (real) correlator
      . Complex signals and complex correlators
      . Continuum
      . Spectroscopic

   2. Digitization

      . Why digital?
      . Sampling and quantization
      . The Shannon sampling theorem
      . Digitization noise
      . Quantization distortion

   3. Spectroscopy

      . Fourier transform theorem
      . XF correlator architecture
      . FX correlator architecture

   4. Large Correlators

      . Cost equation
      . The importance of VLSI chips in modern implementations
     . Flexibility requirements: trading BW / baselines /
         spectral resolution

   5. Sensitivity

 . Basic equation: point source continuum sensitivity on one baseline
   - derivation, abbreviated (see references for full treatment)
 . Losses:
   - delay error
   - digitization noise
   - fringe rotation after digitization
   - double-sideband receivers

. Arrays: point source continuum sensitivity
. Arrays: extended source continuum sensitivity
. Spectroscopic sensitivity
. Strong sources

Notes:

Sections 1, 2, and 3 will be based on Lecture 4 of Perley, Schwab &
Bridle (1989), but re-organized for better clarity and omitting some
arcane points. Section 4 is new, and represents an attempt to
modernize the lecture and bring in some considerations directly
relevent to the design of observations. Section 5 is a condensation
of Lecture 7 from PSB by Crane, with some ideas taken from Ch 9 of
Felli & Spenser (1988) by Walker. Details of delay errors and digital
fringe rotation are moved here because they seem to fit, and this ties
the sensitivity discussion into the correlator fairly well.

_____

5. 9:00 AM Tuesday Propagation Effects   FOMALONT

   (This lecture may swap time slots with #6, Walker)

   1. GENERAL CALIBRATION PROBLEM

       A. Fundamental delay/phase equations from earlier lecture
       B. Types of errors
           1). Propagation effects between source and telescope
     2). Inside telescope system (Walker Lecture?)
       C. Summary of this chapter
           1) Troposphere
           2) Ionosphere
           3) Amplitude and phase
           4) Others: scintillation, corona

   2. General properties of propagation effects
       A. Troposphere
           1) Dry component
           2) Wet component
       B. Ionosphere
       C. Beyond the earth environment

   3. Calibration Methods
       A. Measurement of parameters
       B. Observational Techniques

   4. VLBI considerations

   5. Ultimate limitations

_____

6. 10:30 Tuesday   Calibration/Editing   WALKER

\include{/pingora/cwalker/text/school95/setup}

```
\begin{document}
\start

{\LARGE \bf ~~~~~~~ CALIBRATION and EDITING}
\vskip 0.2cm
{\LARGE\bf ~~~~~~~~~~~~~~~ OUTLINE}
\vskip 0.5cm


{ \large
\vskip 0.5cm

\begin{enumerate}
 \item  Introduction.
   \begin{enumerate}
    \item  True visibility vs. measured visibility.
    \item  Bad data.
   \end{enumerate}

 \item  Symplifying assumptions.
   \begin{enumerate}
    \item  Linearity
    \item  Slow variations in time, frequency and space
    \item  Antenna dependent gains
    \item  Closure
   \end{enumerate}

 \item  Amplitude Gain
   \begin{enumerate}
    \item  Antenna gain
    \item  System temperature
    \item  Opacity
    \item  Digital effects
    \item  Source structure
   \end{enumerate}

 \item  Phase Gain
   \begin{enumerate}
    \item  Geometry
    \item  Atmosphere (Leave mainly for Ed F.)
    \item  Instrumental (cable lengths, clocks, etc.)
    \item  Variations in time (fringe rate) and frequency (delay)
   \end{enumerate}

 \item  Polarization (Leave mainly for Bill C.)
   \begin{enumerate}
    \item  Leakage terms
    \item  Position angle
   \end{enumerate}

 \item  Flux scale - absolute calibration
   \begin{enumerate}
    \item  Small absolutely calibrated antennas and strong sources
    \item  Standard calibrators (Baars etc)
   \end{enumerate}

 \item  Reference frame.
   \begin{enumerate}
```

\item Sky coordinate systems.
        \item Earth coordinate systems.
        \item Earth orientation and motion.
      \end{enumerate}

  \item A priori calibration
    \begin{enumerate}
      \item Previously measured gains
      \item Gain curves
      \item System Temperature
      \item Geometric model
      \item Cable cal
      \item Pulse cal
      \item Phased array calibration for VLBI.
      \item Srong spectral line autocorrelation method (Leave mainly
for Mark C.)
    \end{enumerate}

  \item Calibrator based calibration
    \begin{enumerate}
      \item Point sources
      \item Models: Images and model fits
      \item Flux calibrators
      \item Phase calibrators
      \item Polarization calibrators
      \item Full calibration vs fine tune apriori calibration
    \end{enumerate}

  \item Bandpass calibration
    \begin{enumerate}
      \item Calibrator: Amplitude and phase
      \item Autocorrelations: Amplitude only
    \end{enumerate}

  \item High residual rates and delays: Fringe fitting

  \item Self-calibration (Leave mainly for Tim C.)

  \item Baseline based calibration
    \begin{enumerate}
      \item Closure errors
    \end{enumerate}

  \item Astrometric/Geodetic calibration
    \begin{enumerate}
      \item Solve for everything
      \item As a preliminary for phase referencing
    \end{enumerate}

  \item Some practical concerns
    \begin{enumerate}
      \item Solution tables
      \item Gain tables
      \item Interpolation
    \end{enumerate}

  \item Editing --- Causes of bad data.
    \begin{enumerate}

```
   \item  Pointing
   \item  Weather
   \item  Electronics
   \item  RFI
   \item  Usually antenna dependent.
  \end{enumerate}

 \item  Editing based on monitor data
  \begin{enumerate}
   \item  Flags
   \item  Tsys
   \item  Shadowing
  \end{enumerate}

 \item  Editing based on data.
  \begin{enumerate}
   \item  Smoothness
   \item  Interactive programs
   \item  Calibration closure problems
   \item  Deviation from model
  \end{enumerate}

 \item  Suggested calibration and editing proceedures
  \begin{enumerate}
   \item  A VLA sequence
   \item  A VLBA sequence
  \end{enumerate}

\end{enumerate}
}
\stp
\end{document}
```

7. 1:30 PM Tuesday   Polarization in Interferometry   COTTON

    I. Introduction
    II. What is polarization?
      (quick description of the polarization of light)
    III. Why should I care?
      (several uses of polarization measurments)
    IV. How do I get it?
      - Instrumental response
      - Calibration (theory)
      - Interaction with total intensity calibration
       o phase
       o parallactic angle
       o delay and rate
      - Feed models
       o ellipticity-orientation
       o leakage term
      - Off-axis instrumental polarization
      - Polarization angle calibration

      - Imaging
    V. Phase calibration in practice
      - Phase rereferencing
      - Fringe fitting

- Right-left coherence
　　　- Ionospheric Faraday Rotation
　　　 o external Faraday rotation calibration
　　　　o Faraday self calibration
　　VI. Instrumental polarization calibration
　　　- Calibrator polarization models
　　　- Fitting a feed model
　　　- Iterative calibration
　　　- Feed self calibration
　　VII. Polarization angle calibration
　　　- Unresolved calibrator (VLA)
　　　- Resolved calibrator (VLBA)
　　VIII. Spectropolarimetry

_____

8.　3:00 PM Tuesday　　　Imaging 1　　　CORNWELL

Introduction
- Fourier Inversion
　　* Formation of an image from visibility samples
- Deconvolution
　　* Correction of Fourier plane sampling deficiencies
- Self-calibration
　　* Correction of calibration errors

Fourier Inversion
- Theory
　　* Standard derivation of the dirty image I^D
- The Problem With I^D-Sidelobes
- Weighting of visibility samples
　　* Sampling density
　　* Natural, uniform
　　* Robust weighting
- A Digression on Computation of I^D
　　* Use of the FFT
　　* Convolutional gridding
　　* Aliasing

_____

9.　9:00 AM Wednesday　　　Imaging 2　　　CORNWELL

Deconvolution
　　- The Convolution Equation
　　* $I^D = B * I$
　　* Invisible distributions
　　* Need for a priori information
- The CLEAN Algorithm
　　* Hogbom
　　* Clark
　　* MX
- The Maximum Entropy Algorithm
　　* Imaging as an optimization problem
　　* Form of the entropy
　　* Algorithms
　　* Multiple constraints

- The Briggs' NNLS Deconvolution Algorithm
    * General linear formulation of deconvolution
    * AX=B solvers
    * Failure of deconvolution at high dynamic range
- Comparison of Algorithms
    * known failure modes
- Other algorithms
    * Projection Onto Convex Sets
    * Richardson-Lucy
    * Pixons
    * hybrid algorithms

Self-calibration
    - Origin of Phase Errors
    - Phase closure
    - Self-calibration
    - Comparison of Phase Closure and Self-calibration
    - Practical details of self-calibration

Review and special topics
    - General formulation of imaging
        * A(P)X=B
        * Cannot solve general problem easily
        * Selfcalibration as blind deconvolution
    - Coupled solutions
        * Polarization: I,Q,U,V
        * MFS: I, $I*\alpha$
    - Shift-variant PSFs
    - Error estimation

_____

10. 10:30 Wednesday   Limitations in Imaging   PERLEY

A combination of Chapters 10, 12, 13, 14 and 16 from the 1989 book.

A) Limits on Imaging (why my image isn't perfect)

    . Sensitivity
    . u-v coverage
    . bandwidth
    . time averaging
    . calibration errors
    . 'closure' errors
    . polarization leakage
    . others

B) Simple Analysis of Limits to Image Fidelity

    . Amplitude errors
    . Phase errors

C) Non-Coplanar Coverage

    . Effects on Imaging
    . How to avoid, what to do.

D) Error Recognition (with copious examples)

. Effects of u-v errors
 . single bad point
 . Single baseline error, extended over time.   . Bad single antenna, isolated and over
time.

 . Deciding how bad is too bad.

 . Error Forms

  . Additive (noise, RFI, offsets)
  . Multiplicative (calibration, atmospheric, closure)
  . Convolution (primary beam)

 . Real vs. Imag. Errors -- Odd and Even Effects

  . Connection to Ampl, Phase errors

 . Other Error Origins

  . BW, Time averaging
  . Shadowing
  . Pointing

 E) Error Avoidance

 . How NOT to be limited by errors, if possible.

_____

11. 1:30 PM Wednesday   Spectral Line 1 - Introduction   BRINKS

 Elias has been ill, but will be in tomorrow.

_____

12. 3:30 PM Wednesday   Spectral Line 2 - Advanced   USON

 Lecture on Spectral imaging II:

 Calibration: decomposition of the calibration, bandpass

 Chromatic aberration

 High spectral dynamic range: continuum subtraction,
         calibration and computational errors

 Deconvolution

 Self-calibration

 Example: don't panic

_____

13. 9:00 AM Thursday   Spectral Line 3 -- VLBI   CLAUSSEN

 In this lecture, I am following closely the lecture
 given by Mark Reid last summer and additional
 notes on lectures given at various times by Phil

Diamond. I plan to point up the differences
between spectral line connected element and VLB
interferometry, so it is very important that I know in
advance what others are planning to speak about.

I. Introduction

A. What kind of line sources can be observed
     (high brightness temperature - masers)
     (absorption lines)

B. What are the possible scientific results of
   such observations
     (recent results)

II. Review of basic VLBI concepts (Needed ?, Beasley ?, Walker ?)

III. Planning Spectral Line VLBI Observations

field of view, positional accuracy, spectral resolution,
detect line sources in coherence time ?, phase
referencing (connection) ?, correlator burden (output
data rate), computer facilites, continuum sources

IV. What is the data like coming from the correlator ?

VLBA correlator - a "spectral line" correlator

V. VLBI Spectral Line Calibration - How does it differ from
connected-element (e.g. VLA) spectral line calibration ?

A. Fringe-fitting continuum sources

B. Doppler tracking (and post-observing corrections)

C. Bandpass calibration

C. Amplitude calibration

     1. "Standard" Continuum

     2. Using the autocorrelation spectrum

D. Residual fringe fitting on line source

E. Phase Referencing to a spectral channel

VI. Mapping

A. Fringe-rate mapping - when is it useful ?

B. "Normal" imaging - problems differing from
     "VLA" type imaging

VII. Summary

_____

14. 10:30 AM Thursday   Mosaicing Techniques   HOLDAWAY

Mark tells me he is on holidays. He didn't say when he would be back.

_____

15. 11:15 AM Thursday   mm-Wave Interferometry   CARLSTROM

Some thoughts about unique aspects of mm interferometry:

receivers: SIS & HEMTS - cryogenics etc.
local oscillators:
atmosphere:
field of view:
telescopes:

Why bother with mm interferometry if everything gets more difficult?
(some science motivation - thermal emission)

_____

16. 1:30 PM Thursday   Solar Radio Astronomy   BASTIAN

Tim is in Wapan. We'll have to await his return, next week.

_____

17. 2:15 PM Thursday   Planetary Radio Interferometry BUTLER

I. introduction of myself and outline of talk

in here will be included what will be covered under the
auspices of the "planets", i.e., not the Sun, but basically
anything else in the solar system, including the 9 standard
bodies and their satellites, comets and asteroids, and the
"atmospheres" of any of these objects.

II. motivation

A. physics, or, what we measure from planets
   1. solid surfaces
      i. passive
      ii. radar
   2. atmospheres
      i. as a sub-class, rings, since measurements of them
         are treated more in the radiative transfer sense
         (as a cloud of small particles) than in the solid
         body/surface sense.

B. why do we care about what we measure?

C. why interferometry?

   III. techniques particular to observations of the planets

A. general observational notes, like the fact that we can't
   observe in every configuration and at every frequency and
   at any time, since the bodies move and the geometries
   change.

B. set-up & observation
   1. make sure you're proposing the right measurement.
      (this is a general astronomy note, but i plan to
       give a planetary example or two)
   2. for radar, culmination of events that must occur
      for the experiment to happen.
   3. ephemeris notes.

C. initial calibration. here, just make note that nothing
   particularly wierd is done, i.e., normal observation of
   a primary flux calibrator and a secondary calibrator are
   done. a minor point is that we can't necessarily use
   the same calibrator every time for the same planet...
   also, passive done in continuum, radar and atmospheres
   done in line, so must calibrate bandpass.

D. for radar and atmospheric lines, subtraction of thermal
   component. this obviously isn't unique to planets, and
   i will just mention UVSUB, UVBAS, UVLIN, etc...

E. self-calibration.
   1. doing it in image space.
   2. doing it in visibility space.
      i. the expected visibility functions.
         a. simple uniform disk
         b. limb-darkened
         c. OS radar
      ii. how we can use 1. to self-cal, with modified CALIB

F. making the images.
   1. it's silly not to provide an initial model.
   2. the three main methods
      i. traditional. i.e., CCMOD + MX
      ii. Imke's so-called "planetary CLEAN", which is really
          only a glorified version of i.
      iii. modified UVSUB to subtract model from visibilities,
           MX (or IMAGR) on results, CCMOD+CCMAP+CONVL to

        add back in the UVSUB'd part.
    3. importance of boxes, i.e., we know _exactly_ where the
       flux comes from.

  G. miscellany
    1. frequency = spatial position for radar, and how we
      deal with that (and use it to our advantage).
    2. similarly, for winds, use frequency as a function of
      position to get doppler & hence wind speeds (venus
      & mars).

  IV. results

A. passive thermal
  1. mercury (davelmitchell's stuff)
  2. venus?
  3. mars (don rudy's stuff + others since)
  4. galilean satellites (muhleman, berge, & others)
  5. rings of saturn (grossman & others)
  6. titan (grossman & others)

B. atmospheres
  1. venus (pierce-shaw, goldstein, imke, gurwell, from OVRO,
       others from VLA at K and maybe Q)
  2. earth?
  3. mars (clancy & others from VLA)
  4. jupiter (imke, and a _long_ list of others)
    i. comet sl-9
  5. saturn (grossman & others, imke, and another _long_ list)
  6. uranus (hofstadter, steffes?)
  7. neptune (hofstadter)

C. radar
  1. minor bodies
    i. asteroid & future comet (ostro, imke, palmer...)
  2. others
    i. mercury (me & others)
    ii. venus (haldemann, tryka, & others)
    iii. mars (me & others)
    iv. galilean satellites (possibility)`
    v. titan (muhleman, grossman & others)

  V. conclusions & wrap-up, with maybe a mention of upgrade, and
    what SMA and MMA can do for us...

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18. 3:30 PM Thursday   Astrometry and Geodesy   FOMALONT

  1. Goals of Astrometry and Geodesy
    A. Absolute astrometry and geodesy
    B. Relative astrometry and geodesy

  2. Fundamental interferometry
    A. Basic array measurables
    B. Fundamental equation

C. Simple experiments and solutions
        D. What makes it complicated

    3. Reference frames
        A. Terrestrial frame
        B. Celestial frame
        C. Redundancies

    4. Absolute astrometry and geodesy
        A. Typical experiment and results
        B. Astrometry results
        C. Geodetic results
        D. Limits due to propagation effects
        EE. Comparison with other non-array methods

    5. Relative astrometry
        A. Various relative methods
        B. Typical accuracies and limitations

_____

19. 9:00 AM Friday Synthesis Observating Strategies   BRIDLE

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General point:

This lecture should _not_ introduce new concepts. It has two roles:

  1. to recapitulate the most general issues from the week's lectures

  2. to reassure the shell-shocked that, despite everything previously
     said, you can make decent images with the VLA if you plan the
     observing carefully!

It is important to this lecture that the basics of sensitivity
calculations, bandwidth and time-average smearing, position,
flux-density, polarization and bandpass calibration, and the criteria
for self-calibration, have already been discussed once in earlier
lectures. Also cube deconvolution and bandpass calibration for
spectroscopy.

I am concerned that the main lectures that discussed bandwidth and
time smearing in the ASP book are not being given this time. It will
be important to make sure that these un-sexy but important effects
don't get lost in the lecturer shuffle, and we must make sure there is
a home for them earlier in the week.

I don't intend major tweaks from the previous time I gave this, as
the feedback I have had on the printed notes has been generally positive.
The new material is mostly modernizing details about software that is
available, and encouraging people to use the resources available over the
WWW.

==

1. Introduction -- quick statement like the above

2. Resolution, Baseline Range and Frequency

  a) How much resolution is enough?

*** will need to refer back to point and extended source sensitivity
calculations, extra calibration difficulties for longer baselines ***

  b) What's the largest angular scale to be imaged?

  c) What's the best frequency to use?

-- RFI problems, bandwidth synthesis (assuming this has been touched
on already)

  d) Multiple and hybrid configurations

3. Field of view restrictions

  a) Primary beam

  b) Choosing an IF Bandwidth

*** will need to refer back to earlier discussion of bandwidth
smearing, who is going to cover this ?? ***

  c) Choosing a visibility averaging time

*** will need to refer back to earlier discussion of time-average
smearing, who is going to cover this ?? ***

  4. Total integration time and u-v coverage

*** will need to refer back to sensitivity calculations, and
sensitivity consequences of different weightings ***

The role of snapshots and multiple snapshots

*** will need to refer back to snapshot deconvolution strategies ***

  5. Confusing sources and what to do about them

*** will need to refer back to ungridded subtraction method ***

  6. Special constraints of spectroscopy

Now there are two choices for IF bandwidth and for averaging time
each time: velocity resolution vs. velocity span, and line sensitivity
vs. continuum sensitivity

*** will presume that a spectroscopy lecture has discussed the
pros and cons of analyzing spectral line cubes with or without
same beam pattern in every plane ***

Extra difficulties of compact arrays and narrow bandwidths

  7. Calibration strategies

a) Instrumental -- role of external calibration versus selfcal
-- positions, flux densities

b) Atmospheric -- when can you selfcal?

c) Polarization

*** I will assume that the basic criteria and strategy for selfcal
and polarization calibration have been discussed once already and
that I need mainly to recap and summarize into a strategy rather
than originate fundamentals here ***

d) Bandpass

*** Likewise I will assume that only a refresher is required, the
basics will be covered in an ealrier lecture ***

e) Extreme Games -- P and Q bands (short if running out of time)

8. Dynamic scheduling,

i.e. is there any point showing up for observing and what to do if you do?

9. Help from the Web

Resources available on the NRAO WWW pages -- data archive, RFI plots,
status reports, VLAPLAN

9. How to impress the referees and get your proposal accepted

_____

20. 10:30 AM Friday   VLBI Observational Strategies   WROBEL

Begin VLBI OBSERVING STRATEGIES / Wrobel

(Numerous examples removed from outline.)

STEP 1. PICK A SENSIBLE VLBI TARGET TO IMAGE.
  WHAT IS ITS FLUX DENSITY S [Jy]?
  IS mas-SCALE STRUCTURE PRESENT?
  IF LINE TARGET, WHAT IS LINE'S TRANSITION REST FREQUENCY
    $\nu_{\rm R}$?
  IF LINE TARGET, WHAT IS ...
    Relative line-of-sight motion between Earth \& target?
    Spread of lines ΔV [km s^{-1}]?
    Widths of lines Δv [km s^{-1}]?

STEP 2. DESIRED ANGULAR RESOLUTION $\theta_{\rm HPBW}$?
  SET BY ASTRONOMICAL GOALS.
  WARNING: DIFFUSE EMISSION CAN DISAPPEAR IF $\theta_{\rm HPBW}$
    TOO SMALL.

STEP 3. DESIRED LARGEST ANGULAR SCALE $\theta_{\rm LAS}$?
  FIXED OR CONSTRAINED BY PRIOR VLBI DETECTION, SIZE
    LIMIT FROM CONNECTED-ELEMENT ARRAY, \&/OR THEORY.

UNCERTAIN $\Rightarrow$ TRY FOR
   $\theta_{\rm LAS} \sim (10-20)$ $\times \theta_{\rm HPBW}$
   TO PROBE REASONABLE RANGE
DO NOT CONFUSE $\theta_{\rm LAS}$ WITH COMPONENT SEPARATIONS.

STEP 4. DESIRED OBSERVING FREQUENCY $\nu_{\rm O}$?
  MOST CONTINUUM PROJECTS HAVE REASONABLE FREQ FLEXIBILITY.
  MOST LINE PROJECTS HAVE LITTLE OR NO FREQ FLEXIBILITY.
  SOME PROJECTS NEED MULTIPLE FREQs FROM SINGLE RECEIVER
  SOME PROJECTS NEED MULTIPLE FREQs FROM MULTIPLE RECEIVERS.
  SOME PROJECTS NEED MATCHED $\theta_{\rm HPBW}$ AT MULTIPLE
   FREQUENCIES.

STEP 5. WHICH STOKES PARAMETERS NEEDED?
  LINEAR POLARIMETRISTS NEED $I(RR,LL)$, $Q(RL,LR)$, $U(RL,LR)$.
  CIRCULAR POLARIMETRISTS NEED $I(RR,LL)$, $V(RR,LL)$.
  DETECTION OF WEAK SOURCES TAD EASIER IF JUST RCP OR LCP USED.

STEP 6. DESIRED RECORDED BANDWIDTH $\Delta\nu_{\rm REC}$?
  INTRICATELY LINKED TO ...
    Recording formats.
    Bits / sample.
    Ability to oversample (OS) relative to Nyquist.
    Aggregate bit rate (ABR)
      $ABR = 2 \times \Delta\nu_{\rm REC}
      \times OS \times (bits/sample).$
  LINE TARGET: NATURAL LIMIT TO $\Delta\nu_{\rm REC}$ SET BY
    SPREAD OF LINES ΔV.
  CONTINUUM TARGET: NO NATURAL LIMIT TO $\Delta\nu_{\rm REC}$,
    JUST PRACTICAL LIMITS.
  VLBA FORMATS.
  MARK III FORMATS.

STEP 7. SELECT TRIAL VLBI ARRAY
  CONSULT VLBI DOCUMENTATION FOR INFORMATION NEEDED TO PICK
    ANTENNAS FOR TRIAL ARRAY.
  DO ANTENNAS IN TRIAL ARRAY MEET SPECIAL NEEDS, IF ANY?
  END SPECIAL NEEDS ASSESSMENT.
  ACQUIRE SOFTWARE TOOLS TO ASSESS GEOMETRY OF TRIAL ARRAY.
  DOES TRIAL ARRAY PROVIDE DESIRED $\theta_{\rm HPBW}$ \&
    $\theta_{\rm LAS}$?
  DOES TRIAL ARRAY HAVE ``ENOUGH'' ANTENNAS?
  END GEOMETRIC ASSESSMENT.

STEP 8. TARGET DETECTABLE IN FRINGE-FIT INTERVAL $\tau_{\rm ff}$?
  $\tau_{\rm ff} \lapprox$ ATMOSPHERIC COHERENCE TIME
    $\tau_{\rm atm}$ AT ANTENNAS WITH H MASERS.
  NEED FORMATS SUPPORTED BY ANTENNAS IN TRIAL ARRAY.
  NEED ZENITH $SEFD$s OF ANTENNAS IN TRIAL ARRAY.
  RMS THERMAL NOISE DURING $\tau_{\rm ff}$ [s] IN
    VISIBILITY AMPLITUDE OF RR OR LL BASELINE
    BETWEEN ANTENNAS i \& j
  LINEAR POLARIMETRISTS FRINGE-FIT ON RR \& LL, NOT
    RL \& LR.
       TRIAL BASELINE HAS $S/\Delta S_{\rm ij}$ \gapprox ~FEW ...
  TRIAL BASELINE HAS $S/\Delta S_{\rm ij}$ \lapprox ~FEW ...
       MUST PHASE REFERENCE ANY TARGET, WHETHER STRONG OR WEAK,
    IF NEED ABSOLUTE α \& δ AXES.

STEP 9. TOTAL INTEGRATION TIME $t_{\rm int}$ REASONABLE?
  $t_{\rm int}$ WILL BE OF ORDER HOURS FOR FULL TARGET
    TRACK IN u-v PLANE.
  RMS THERMAL NOISE GIVEN $t_{\rm int}$ [s] IN
    RR OR LL IMAGE FROM N IDENTICAL ANTENNAS
  FOR ARRAY OF NON-IDENTICAL ANTENNAS ...
 I, Q, U, V, P NOISE
  MIGHT WANT TO SIMULATE TARGET IMAGE
  END TRIAL ARRAY SENSITIVITY ASSESSMENT.
  TURN TO UNDISTORTED FIELD-OF-VIEW (FOV) ASSESSMENT.

STEP 10. DESIRED TIME \& BW AVERAGING AFTER FRINGing?
  TIME AVERAGING: NATURAL $\tau_{\rm a}$ LIMITS.
  FACTORS IMPACTING $\tau_{\rm a}$ SELECTION.
 FACTORS IMPACTING BANDWIDTH AVERAGING IF CONTINUUM TARGET.
 FACTORS IMPACTING BANDWIDTH AVERAGING IF LINE TARGET.
 END TIME \& BW AVERAGING, TURN TO FOV CONSEQUENCES.

STEP 11. DOES TARGET FIT IN UNDISTORTED FOV $\pm\theta_{\rm max}$?
  ASSUME DELAY TRACKING CENTER
   = PHASE REFERENCE POSITION
   = VLBI ARRAY POINTING POSITION.
 FOV FROM BANDWIDTH SMEARING.
 FOV FROM TIME-AVERAGE SMEARING.
 FOV FROM NON-COPLANAR BASELINES.
 FOV FROM SYNTHESIZED BEAMS OF CONNECTED-ELEMENT ARRAYS
   IN TRIAL VLBI ARRAY.
 FOV FROM PRIMARY BEAMS OF SINGLE DISHES IN TRIAL VLBI ARRAY.
 TARGET OUTSIDE FOV $\pm\theta_{\rm max}$? ...
 TARGET INSIDE FOV $\pm\theta_{\rm max}$? YES.
 TRIAL ARRAY BECOMES DESIRED ARRAY.

STEP 12. OPTIMAL TIMES, SEASONS, \& YEARS?
  TIME-OF-DAY EFFECTS.
  EARTH SEASON EFFECTS.
 SOLAR CYCLE EFFECTS.

STEP 13. PREPARE \& SUBMIT OBSERVING PROPOSAL
  DEADLINES FOR NETWORK \& NON-NETWORK PROPOSALS.
  CONSULT ANNOUNCEMENTS \& POLICY DOCUMENTS.
  IF PROPOSAL SUCCESSFUL ...

STEP 14. MAKE ANTENNA \& TAPE CONTROL SCHEDULES
  IF VLBA \&/OR VLA INVOLVED, AOC DATA ANALYSTS
   WILL E-MAIL YOU DETAILED INSTRUCTIONS.
  ASCII SCHEDULE FILES SHOULD POINT VLBI ARRAY ...
   At target.
   At strong ``calibrators''.
   At other ``calibrators''.

STEP 15. CORRELATOR TOLERANCE ON TARGET POSITION ERROR?
  FRINGE RATE TOLERANCE.
  DELAY TOLERANCE.
  PROVIDE EVEN BETTER POSITION BECAUSE ...

End VLBI OBSERVING STRATEGIES / Wrobel

21. Closing Statements   PERLEY

     He'll try not to embarrass anybody but himself.

From: abridle (Alan Bridle)
To: rperley
Subject: C band sensitivity
Date: Fri, 26 May 1995 09:35:33 -0400

Rick,

I am a bit puzzled by some changes you made to the Observational
Status Summary. Since the October 1994 version of Table 4, the C band
system temperature has decreased by 1 K from 45 to 44 K but
the quoted rms sensitivity in 10 min has decreased by 40%.

I was not aware that any real changes had occurred at C Band in
this interval, but I certainly don't see how a 2% decrease in
system temperature corresponds to a 60% change in sensitivity.

Is there an error lurking here somewhere, and which numbers
do you actually believe?

A.

From: abridle (Alan Bridle)
To: tcornwel, rperley
Subject: Bandwidth synthesis
Date: Fri, 26 May 1995 13:48:11 -0400

is not actually in the prospectus of either of Tim's lectures
or of Rick's. Is one of you going to mention it?

A.

From: abridle (Alan Bridle)
To: rperley
Subject: Pointing errors
Date: Fri, 26 May 1995 14:00:10 -0400

You don't mention them explicitly in Lecture 10, but
they must be a major limitation at Q Band unless
well-corrected by reference observations. They
probably deserve to be added?

A.

From: tcornwel@nrao.edu (Tim Cornwell)
To: abridle@polaris.cv.nrao.edu (Alan Bridle), tcornwel@polaris.cv.nrao.edu,
    rperley@polaris.cv.nrao.edu
Subject: Re: Bandwidth synthesis
Date: Fri, 26 May 1995 14:32:08 -0600

At 01:48 PM 5/26/95 -0400, Alan Bridle wrote:
>
>is not actually in the prospectus of either of Tim's lectures
>or of Rick's. Is one of you going to mention it?
>
>A.
>
>
I'll mention it briefly.

From: abridle (Alan Bridle)
To: rperley
Subject: Sensitivity calculations again
Date: Sat, 27 May 1995 17:40:57 -0400

Rick, As have not heard from you and I do have to try to
finish this off before I leave I am presuming that the
Observational Status Summary has the right numbers for K
(as these are closer to what is actually observed) and
that the discrepancies are probably with the inferred
values of the antenna efficiencies. I am therefore re-adjusting
all the numbers in my lecture and in the VLAPLAN program
to correspond to the K values you gave in the last Observational
Status Summary.

If this is not correct, let me know as soon as possible.

I will not be able to recompile VLAPLAN once I am at the AOC
as I do not think you have the compiler in Socorro.

A.

From: abridle (Alan Bridle)
To: rperley
Subject: departure
Date: Mon, 29 May 1995 07:36:12 -0400

Hi Rick,

I will leave as planned first thing tomorrow and expect to
get to Socorro Thursday evening. I will plan to do some
more tweaking to my lecture while on the road, but I have
put into the regular mail a one-sided printout of the
current state of my notes that you could use for distribution
if you urgently need to before I can hand you a more
finished copy in Socorro. I have also updated VLAPLAN to
your new K values in the anon-ftp area on ftp.aoc.nrao.edu.

My AIPS++ Glossary of radio astronomy and computing is
also in reasonable shape (I will be adding to it for quite
a while but there is a full set of files available now)
and this might be quite useful to students with WWW
connections. It is now accessible from the AIPS++ WWW
entries: on the AIPS++ Home Page, go to the entry for the
On-Line Documentation System, then to the entry for the
Glossary. There are quite a number of basic definitions
and formulae of radio interferometry in there now and it
may be worth pointing students to it as a reference.
Take a peek at it if you have time and tell me what you
think.

See you Friday,

A.

From: abridle (Alan Bridle)
To: elatasa
Subject: Just confirming ...
Date: Mon, 29 May 1995 21:41:11 -0400

Hi Eileen,

Just to confirm that I'm leaving C'ville Tuesday a.m. and
will expect to get into Socorro Thursday evening. I have
a key card for the AOC and will look for my room key
in the mailboxes.

Thanks,

Alan B.

From: abridle (Alan Bridle)
To: ahbridle@zia.aoc.nrao.edu
Subject: forwarded message from Loretta Appel
Date: Sat, 3 Jun 1995 12:45:42 -0400

------- start of forwarded message (RFC 934 encapsulation) -------
Received: from cv3.cv.nrao.edu by polaris.cv.nrao.edu (AIX 3.2/UCB 5.64/4.03)
        id AA28439; Thu, 1 Jun 1995 20:14:56 -0400
Received: from zia.aoc.nrao.edu by cv3.cv.nrao.edu (4.1/DDN-DLB/1.13)
        id AA29085; Thu, 1 Jun 95 20:14:48 EDT
Received: (from lappel@localhost) by zia.aoc.nrao.edu (8.6.10/8.6.10) id SAA21352; Thu, 1 Jun 1995 18:11:16 -0600
Message-Id: <199506020011.SAA21352@zia.aoc.nrao.edu>
From: Loretta Appel <lappel@aoc.nrao.edu>
To: ss95@zia.aoc.nrao.edu
Cc: lappel@zia.aoc.nrao.edu
Subject: NRAO summer school
Date: Thu, 1 Jun 1995 18:11:16 -0600

>From lappel@aoc.nrao.edu Thu Jun 1 18:09:22 1995
Date: Thu, 1 Jun 1995 18:09:21 -0600
X-Sender: lappel@zia.aoc.nrao.edu
X-Mailer: Windows Eudora Version 1.4.4
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"
To: lappel
From: Rick Perley <rperley> (by way of lappel@aoc.nrao.edu (Lori Appel))
Subject: Send it Away!
Status: R

                    31 May 1995
    Dear Participant:

    We are in the final planning stages for the Synthesis Summer School.
Enclosed with this mailing is the final lecture schedule, the schedule for the
shuttle from the Albuquerque airport to Socorro, and information about
registration.

    1) Final Lecture Schedule.

All lectures are in the Macey Center Auditorium.

Monday, June 5.

Time   Title   Lecturer
0830 Opening Remarks   Rick Perley
0900 Introduction to Interferometry   Juan Uson
1030 Antennas in Radio Astronomy   Peter Napier
1200 Lunch
1330 Elements of Radio Interferometry   Tony Beasley
1500 Correlators and Sensitivity   Larry D'Addario
1630 Discussion Groups

    Tuesday, June 6.

0900 Calibration and Editing   Craig Walker
1030 Propagation Effects   Ed Fomalont
1200   Lunch

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1330 Polarization in Interferometry          Bill Cotton
1500 Imaging 1  -- Imaging and Deconvolution      Tim Cornwell
1630 Discussion Groups


     Wednesday June 7.

0900 Imaging 2  --                    Tim Cornwell
     Self-Calibration and Special Topics
1030 Limitations in Imaging              Rick Perley
1200 Lunch
1330 Spectral Line 1-                Elias Brinks
     Introduction to Spectral Techniques
1500 Spectral Line 2-                Juan Uson
     More Advanced Spectral Techniques
1630 Discussion Groups




     Thursday, June 8.

0900 Spectral Line 3 -               Mark Claussen
     VLBI-specific Spectral Techniques
1030 Mosaicing Techniques              Mark Holdaway
1115 mm-Wave Interferometry             John Carlstrom
1200 Lunch
1330 Solar Radio Interferometry          Tim Bastian
1415 Planetary Radio Interferometry        Bryan Butler
1530 Astrometry and Geodesy            Ed Fomalont
1630 Discussion Groups
1800 Summer School Dinner @ Macey Center


     Friday, June 9.

0900 Observational Strategies 1
     A Hitch-Hiker's Guide to the VLA        Alan Bridle
1030 Observational Strategies 2
     A Practical Guide to Planning        Joan Wrobel
     a Perfect VLBI Project
1145 Wrap-up                   Rick Perley
1200 Lunch
1330 Data Tutorial  (all afternoon)     various

     *** End of the Official Part of the Summer School ***

     Saturday, June 10.

     Outdoor Activities -- details to be announced.
     _____
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   2) Shuttle schedule. Listed below is a schedule of the
approximate departure times for the shuttle from the Albuquerque
airport to Socorro. The vans or bus will leave from the east end of
the airport departure area. When you arrive at the airport, take the
escalator down to the baggage level, proceed through the doors to the
street, and turn right. At the end of the concourse is the area
designated for our vans or buses. There will be a person at the
airport information booth (located between the escalators and the

outside doors, on the baggage level) who can direct you to our loading
area. If no shuttle is visible, be patient. One will arrive soon.

    1000 For Saturday Arrivals
    1200 Noon
    1315
    1500
    1715
    1930
    2045
    2300

    _____

    3) Registration. Registration will be held at the NRAO Array operations
Center between 11AM and 9PM on Sunday. Late arrivals can register on Monday
at the AOC between 8:00 - 9:00 AM. Participants arriving via the NRAO
shuttle will be brought directly to the registration. Payment is due at time
of registration. Acceptable methods of payment are by cash, check drawn on a
U.S. Bank or by credit card (Visa, Master Card, Carte Blanche and Diners
Club International).

    We welcome you to New Mexico and look forward to a successful summer
school.

    Rick Perley

------- end -------