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November 21, 1984

Dr. Alan H. Bridle
National Radio Astronomy Observatory
Charlottesville, VA
22901

Dear Dr. Bridle:

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We inaugurate the Special Collections Program this month with two volumes in the life sciences and two in physics. I have enclosed an information sheet describing both physics titles. You will receive a complimentary copy of the collection containing your work within the next few weeks.

I have also included a copy of our most recent catalog to introduce you to Benjamin/Cummings and to convey an idea of our publishing program. I welcome your comments on the volume you receive, on the concept of the series, and any ideas you might have for future collections. In addition, we are very interested, of course, in any text writing you may undertake.

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Yours truly,

Richard W. Mixter
Editor, Advanced Book Program

cc: William Kaufmann, Annual Reviews Inc.

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October 19, 1984

Dr. Alan H. Bridle
National Radio Astronomy Observatory
Charlottesville, Virginia 22901

Dear Dr. Bridle:

I am pleased to inform you that the Board of Directors of Annual Reviews Inc. has authorized us to make arrangements with other appropriate publishers for publication of special collections of articles from the various Annual Review series.

Your article, "Extragalactic Radio Jets," has been selected for inclusion in one of the first of these collections, which will be published late in November 1984 by the Benjamin/Cummings Publishing Company. A complimentary copy of the volume will be sent to you upon publication.

Yours sincerely,

ANNUAL REVIEWS INC.

William Kaufmann
Editor-in-Chief

WK: jm

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F. K. Lamb
 Department of Physics
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In recent years, high energy astrophysics has been one of the most active, exciting, and rapidly advancing areas of physics and astronomy. This branch of astrophysics is concerned with the highly energetic phenomena that occur in the early universe, in the vicinity of collapsed objects, such as degenerate dwarfs, neutron stars, and black holes, and in violent events, such as stellar explosion or collapse. It involves the study both of the physical processes that produce X-rays, gamma-rays, relativistic particles, and gravitational radiation, and of the astrophysical sites where these processes occur.

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13 August 1984

Dear Alan,

Thank you for sending your preprint on Extragalactic Radio Jets. van Breugel mentioned to me that he had some "old" VLA maps on 0844+31. Perhaps a more intensive investigation as you suggest, however, would be very valuable. I am asking Wil for his best radio map of 0844+31 but if you know of a better one I would appreciate borrowing about it because I am trying to get together a review article of my own about active objects in the vicinity of jets.

On that subject I found your Review on Radio Jets Extremely interesting. First of all the distribution of red shifts between the two regions $7^h < R.A. < 17^h$ and $19^h < R.A. < 5^h$ is much different. Do you know of any reason why objects of different red shifts should be preferentially observed in different directions in the sky?

I see some potentially interesting associations with 1004+14, 1216+06 and 0336-35 but I suppose I will have to wait for those unpublished maps to appear before I check further.

Incidentally I wonder if you know whether 0924+30 (Nature 258, p584) has any jet aspects to go with those compact radio sources which appear to be aligned with it?

Best regards,
Chip Carp

NATIONAL RADIO ASTRONOMY OBSERVATORY
EDGEMONT ROAD
CHARLOTTESVILLE, VIRGINIA 22901
TELEPHONE 804-296-0211 TWX 510-587-5482

28 July 1984

Dear Chip,

I enclose a preprint of our Ann. Rev. article,
as you requested.

Unfortunately, it does not answer your question
re 0844 + 319. I don't seem to have the letter
reference in my files. The only comparison I knew
of was that in Fig. 1 of Grueff and Vigotti (1974),
A.A., 35, 491. I am considering a VLA proposal
for 0844 + 319 however, and if I come across the
reference you mentioned while putting that proposal
together, I'll certainly send it on.

With best wishes,

St. B.

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17 July 1984

Dear Alan,

Kellerman told me you were writing an Annual Reviews Article on Radio Jets. It has not yet arrived in Germany where I am spending a year. Could you send me a preprint of it?

I am interested in the whole subject but I am particularly interested in the radio galaxy 0844+31 (4C 31.32). There is a reference which I have lost and am trying to recover. It was after van Breugel's papers in 1977 and 1980 I believe. It compared the exact position measurements of the quasar nearby with the hot spot in the north radio lobe. I believe Maarten Schmidt's name was on the paper. Do you know that reference? It contained a radio map and some discussion.

If you knew the reference and could communicate it to me I would be extremely grateful. Of course it would be best if it was in your review article.

Thanks you.

Chip

HALTON ARP

NATIONAL RADIO ASTRONOMY OBSERVATORY
Edgemont Road, Charlottesville
Virginia 22901

16 April 1984

Mr. Keith Dodson,
Production Manager,
Annual Review of Astronomy and Astrophysics,
Annual Reviews Inc.,
4139 El Camino Way,
Palo Alto,
CA 94306

Dear Mr. Dodson,

We enclose the corrected proofs of our article "Extragalactic Radio Jets". We have indicated essential typographical corrections in blue pencil. We now note that you changed page references to the Monthly Notices "pink pages" to lower case p, e.g. ref 206, 6lp, where we called for upper case, e.g. ref 206, 6lP. Monthly Notices itself uses the upper case of a reduced font size, but most other journals use the upper case of a regular font when setting references to the "pink pages". We have made the changes in the proofs in blue pencil, but leave the final disposition of this to your discretion.

We have indicated corrections to the manuscript in red pencil. Most are further updates to the references, which you may prefer to ignore. The change to reference 122 should be made, however; this article appeared in the MNRAS though we were told earlier by one of its authors that it had been submitted to Ap.J. The insertion of a comma on p.339, line 7 from the bottom, will assist comprehension of this sentence. The word "that" inserted in the following sentence was not in our original manuscript and is ungrammatical; we have indicated this as a typographical correction.

Yours sincerely,

Alan H. Bridle

Richard A. Perley

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CHARLOTTESVILLE, VIRGINIA 22901
TELEPHONE 804-296-0211 TWX 510-587-5482

9 April 1984

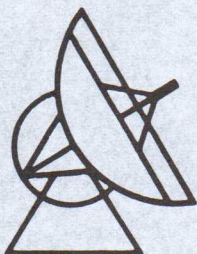
Dear Ivan,

Thank you for your note with the data on 3C454.3. Unfortunately, only a few people had sent us preprints of their talks at Bologna by the time our review article was submitted, so our coverage of individual sources reported on there reflects this incompleteness. This will doubtless be evident to the readers of the review, as only a few IAU #110 papers are referenced whereas the earlier work is referenced fairly completely. By the time your note got here, the galleys had been corrected also, so it is too late to make anything but very serious changes. As your new readers show that 3C454.3 confirms the trend discussed in §6.2.3, I think it is o.k. to let things stand as they are. The jet field is so busy these days that we are resigned to the review being outdated very rapidly!

I enclose a preprint of a related AJ article which may also be of interest.

With best wishes,

WGA



Max-Planck-Institut für Radioastronomie

Dr. A Bridle
National Radio Astronomy Obs.
Edgemont Road
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Auf dem Hügel 69
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Durchwahl 5 25/ 243
Telex: 08 86 440 mpifr d

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(BLZ 380 700 59)

Dear Alan,

A copy of your preprint on "Extragalactic Jets" for Ann. Rev. Vol. 22 has just come into my hands. I would like to correct a statement made in Section 6.2.3 regarding 3C454.3. We presented, in Bologna, a VLBI map of 3C454.3, made at 6 cm using both amplitudes and closure phases. The map shows a bright core, and a jet extending to about 10 m.a.s. from the core (~ 90 pc) in P.A. $\sim -65^\circ$, i.e. on the same side as the arcsec MERLIN jet, but differing in P.A. by $\sim 15^\circ$. 3C454.3 is thus in the class of the other core-dominated objects. There is no counter jet at a level of 2 percent. The appearance is confirmed by more recent maps at 18, 6 and 2.8 cm. Perhaps you could still correct your article, or add a footnote?

Best regards,

I. Pauliny-Toth

(I. Pauliny-Toth)

P.S. Very recent observations we have made show the core has become elongated: the required apparent v/c is about 20!
(For $H_0 = 55$, $q_0 = .05$)

NATIONAL RADIO ASTRONOMY OBSERVATORY
Edgemont Road, Charlottesville
Virginia 22901

27 March 1984

Dr. J.M.Marcaide,
Max Planck Institut fur Radioastronomie,
Auf dem Hugel 69,
D 5300 Bonn 1,
W. GERMANY

Dear Dr. Marcaide,

Thank you for your letter of 20 March, and the preprint, on your observations of 1038+528 A,B. They were not "missed" in fact, but were not included in our list of known jets as the jetlike features do not meet the 4:1 elongation criteria that we imposed. Very few VLBI "core-jets" do meet this criterion at present; many of the VLBI references in Table 1 are there because they show one-sided extensions of the cores in sources with large-scale jets (see the bottom of p.2 in the enclosed preprint of the review).

I recognise that our elongation criterion excludes many jetlike features which future observations with higher resolution and dynamic range may well show to be jets. But this is quite deliberate - the number of clear "jets" is now so large that I feel the time has come for stiff definition by observers of what the term "jet" is to mean. The question of which sources should be carried along in our Table 2 is unfortunately subjective; possibly we should have included your sources there.

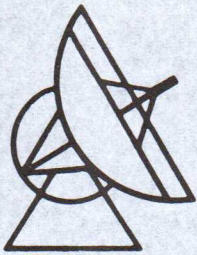
The results from the improved VLBI networks and dedicated arrays which will come on line in the next few years may make our jet definition less difficult to meet for small-scale jets. An interesting possibility may be that some of the present difficulty could reflect jet physics rather than instrumental effects, however - small-scale jets seem to quench in intensity much faster than large-scale jets do. This could indicate that they are less turbulent than the larger scale jets (as we mention at the top of p.10 in the review preprint). Again, observations with better resolution and dynamic range may show if this is indeed the case.

Thank you for your interest in our article, and for sending the preprint with your letter.

Yours sincerely,



Alan H. Bridle



Max-Planck-Institut für Radioastronomie

Alan H. Bridle

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Dear Colleague,

I just had access to a preprint of your interesting review "Extragalactic Radio Jets", where you list all radio sources known to you (in mid-August 1983) to have jets. I must have done a bad job in my Bologna talk since you have missed 1038+528 A, B, both "VLBI core-jets".

I have taken the liberty to enclose a recent preprint of us. You may be interested in Fig. 5 in special. Related publications are Marcaide & Shapiro: 1983, Astron. J. 88, 1133; Marcaide & Shapiro: 1984, Astrophysical J. 276, 56.

Best regards,

(J.M. Marcaide)

INTEROFFICE MEMORANDUM
MAIL CODE 105-24
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CA 91125

TO A.H. Bridle
FROM Dave Hough
SUBJECT Jet List

DATE 3/2/84
818-356-4001
EXTENSION MAIL CODE 105-24

Dear Dr. Bridle,

I was just clearing off my desk when I noticed a note I had made to mention to you three jet sources which had not appeared in your 16 March 1983 version (the most recent I have) of the jet list. I do not know if ^{the} task has become so immense now that you no longer maintain the list, but in the event that you do I'll mention these three sources:

- 1) J.O. Burns - 3C200 - unpublished (as far as I know) 6 cm VLA map.
IAU = 0824+29
Faint galaxy? no redshift
- 2) Swamp, Sishi, & Salter - 0932+02 -
in IAU #97, p.411
Q50
- 3) Same as 2) - 1244+32 - Q50

Start
review
6 March

If you do plan an updated version of this list, I'd appreciate being on the mailing list. John Buetta and I here have found it a very useful guide in our studies of the correlation of jet properties with other outer lobe properties. Thanks! Regards, Dave Hough

NATIONAL RADIO ASTRONOMY OBSERVATORY
Edgemont Road, Charlottesville
Virginia 22901

9 March 1984

Dr. G.R.Burbidge,
Editor, Annual Review of Astronomy and Astrophysics,
Annual Reviews Inc.,
4139 El Camino Way,
Palo Alto,
CA 94306

Dear Geoff,

Thank you for your letter of 15 February. Preparing our review article was indeed stimulating, and I am grateful for the opportunity to have done it. I think an interesting topic for a future review might be "Relativistic Particle Acceleration in Extragalactic Systems"; Roger Blandford would of course be a good candidate, but you might also consider Jean Eilek of New Mexico Tech - she has a good grasp of this subject and is actively developing some models herself. There is also a rapidly growing literature on "Jets in Stellar Systems"; Arie H. Konigl might be a good author for a review on this.

Finally, I think it may not be long before you could usefully recycle the perennial topic of "Large Scale Extragalactic Radio Sources". There is a wealth of new VLA data on hot spots, filaments, bubbles, rings, magnetic fields, etc. in the lobes of big sources, as well as new work on optical/radio and X-ray/radio correlations involving the large, powerful sources. Robert Laing, now of RGO, would be a good person to treat the recent developments in these areas.

Yours sincerely,

Alan H. Bridle

NATIONAL RADIO ASTRONOMY OBSERVATORY
Edgemont Road, Charlottesville
Virginia 22901

27 February 1984

Mr. Keith Dodson,
Production Editor,
Annual Review of Astronomy and Astrophysics,
4139 El Camino Way,
Palo Alto,
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Dear Mr. Dodson,

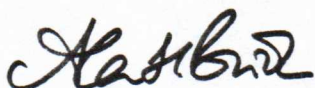
I enclose the annotated copy-edited manuscript for the article "Extragalactic Radio Jets" by myself and R.A.Perley, scheduled for Vol.22 of the Annual Review of Astronomy and Astrophysics. I have attached printouts of the revised text in several places where I felt my handwritten corrections or additions (in red throughout) might not be completely clear. Please use them only to verify the textual content, as I have not made all of your format changes (e.g. punctuation, "Section" instead of the Section symbol, etc.) in the computer file containing my copy of the article. As none of our revisions is at all extensive, these printouts are single-spaced for compactness.

I am quite happy with most of your suggested revisions to the text; many improve its readability, and I am grateful for them. In a few cases however they change or obscure our intended meaning. I have noted these cases in the margin beside your comments, and hope you will accept our wording or rewording for them.

Some of the references are still unpublished; I have contacted some of the authors to obtain publication dates, but some journals (e.g. Astronomy and Astrophysics) do not provide these. I hope it is acceptable to you that these references remain as "in press".

I also enclose the completed copyright transfer and reprint order forms, and a list of subjects for indexing.

Yours sincerely,



Alan H. Bridle

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Author(s) Name(s) Alan H. Bridle and Richard A. Perley

Annual Review of Astronomy and Astrophysics Volume 22

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Signed Alan H. Bridle Date 27 Feb 1984

Author: Alan H. Bridle and Richard A. Perley

Title: Extragalactic Radio Jets

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- Radio sources $\begin{matrix} \text{— statistics} \\ \text{— unified models} \end{matrix}$
- Radio galaxies
- Quasars
- Magnetic fields
- Polarization
- Galaxies, X-ray emission
- Galaxies, interstellar medium
- Synchrotron radiation
- Jets, relativistic
- Jets, instabilities
- Symmetry properties of radio sources
- VLBI

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Date 13 February 1984

by Keith Dodson
Production Editor

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in Volume 22 of the Annual Review of Astronomy and Astrophysics.

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Alan H. Bridle
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27 February 84
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I have read the enclosed proofs and approve the manuscript for publication.

Date 27 Feb 1984 Signature Keith Dodson

* Revised Figure 1 will be sent to typesetter with manuscript

Keith Dodson

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Keith Dodson

February 15, 1984

Dr. Alan H. Bridle
National Radio Astronomy
Observatory
Edgemont Road
Charlottesville, VA 22901

Dear Alan:

On behalf of the Editorial Committee of the Annual Review of Astronomy and Astrophysics I wish to extend to you our sincere thanks for your valuable contribution to Volume 22. We recognize the considerable effort expended in the preparation of this review, but hope that you found the task not entirely without its pleasures and compensations.

We would like to ask one final favor of you. The Editorial Committee would greatly appreciate your suggesting other topics in the field of astronomy and astrophysics that, in your estimation, should be reviewed in subsequent years, as well as writers for such reviews.

Thank you again for your cooperation in making this Annual Review of Astronomy and Astrophysics possible.

Sincerely,

G. Burbidge
Editor

GB:bt

ANNUAL REVIEW OF ASTRONOMY AND ASTROPHYSICS

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Geoffrey Burbidge
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27 January 1984

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PRODUCTION EDITOR
Keith Dodson

Dr. Alan H. Bridle
NRAO
Edgemont Road
Charlottesville, VA 22901

Dear Dr. Bridle:

Thank you for your letter of January 24. I will try to respond to your questions in the order that you raised them.

1. We have not had to request any cuts this year; thus, your article will be published at its submitted length.
2. Your article has already been copyedited. I sent it off to one of the associate editors approximately three weeks ago and expect it back from him sometime within the next two weeks. Thus, you should receive a copy of the edited manuscript sometime within the next three weeks. The page proofs will then be arriving sometime in the period between mid-April and mid-May (approximately 6 weeks after you return the edited manuscript to me).
3. The changes that you wish to incorporate into the article should be made when you receive the edited manuscript. If a section is rewritten or inserted, it would be easiest for me if you type up the new material and indicate on the edited manuscript where it should be inserted. Minor changes of wording need not be typed up; just make the changes on the copy of the manuscript, and I will then make the necessary changes on the master manuscript here.

Sincerely yours

Keith Dodson

P.S. I had already sent the artwork for your article off to press when I received the revised Fig. 1. Thus, I'll send the revised figure to them when the manuscript is sent to press.

NATIONAL RADIO ASTRONOMY OBSERVATORY
Edgemont Road, Charlottesville
Virginia 22901

24 January 1984

Mr. Keith Dodson,
Production Editor,
Annual Review of Astronomy and Astrophysics,
4139 El Camino Way,
Palo Alto,
CA 94306

Dear Mr. Dodson,

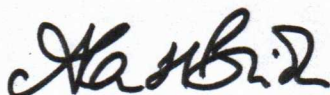
I have several questions concerning the article
"Extragalactic Radio Jets" by myself and R.A.Perley, scheduled for
Vol.22 of the Annual Review of Astronomy and Astrophysics.

First, have you yet decided whether to run it at the
submitted length? We would appreciate being informed of your
decision as the possibility of having to restructure it to meet a
smaller page limit hangs over us rather ominously.

Second, can you advise us what your schedule will be for copy
editing, proofs, etc. for this volume?

Third, we have some minor changes we should like to make in
response to comments from people who read the review since it was
submitted. These will not impact the length of the article, but
will increase its clarity and (in one or two cases) its
correctness - we wish to recast one equation in a form that will
be more familiar to specialists in fluid mechanics, and to make
some small textual changes. I have let the changes accumulate as
we had not heard from you whether the article will have to be
shortened, also to keep them together for one communication to
you. But I am now wondering when would be the most suitable time
to send them to you in relation to your production schedule for
the article.

Yours sincerely,



Alan H. Bridle

CALIFORNIA INSTITUTE OF TECHNOLOGY

PASADENA, CALIFORNIA 91125

THEORETICAL ASTROPHYSICS 130-33

TELEPHONE (213) 356-4597

Dec 20.

Dear Rick,

Many thanks for the copy of your excellent review
 an abridging ~~is~~ with a few ^{changes} ~~changes~~ document which
 supposed to be published in RMP. As I think you
 know, this article was commissioned eight years ago.
 It is a time when it was still practical to review the
 field in the way that we had originally
 intended. Those days have long passed. I think that there
 is a good research monograph that can be written combining
 review and interpretation but the basic problem
 is that none of us are prepared to take off the necessary
 six months to buckling down and doing it. Current research
 problems always seem more attractive. Nevertheless, despite
 its rather unsatisfactory state we have been persuaded
 that the article will serve ~~some~~ ^{more} purpose published than
 waiting for us to tidy it up.

I would be very grateful if you, Alan et al. could
 find time to look over parts of it. What we are most
 interested in is serious factual ~~errors~~ ^{errors} as opposed to
 issues where better organization, ~~readability~~ ^{writing} etc could
 improve the readability. It is too late to do
 much about the latter.

I gather from Mitch that you have kindly agreed to
 supply some illustrations. We are negotiating to have these

NATIONAL RADIO ASTRONOMY OBSERVATORY
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14 December 1983

Production Editor,
Annual Review of Astronomy and Astrophysics,
4139 El Camino Way,
Palo Alto,
CA 94306

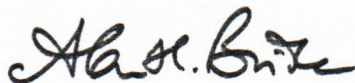
Dear Mr. Dodson,

A small error in the glossy submitted to you as Figure 1 of the article EXTRAGALACTIC RADIO JETS by A.H.Bridle and R.A.Perley recently came to my attention. The degrees of declination were incorrectly labeled on the right hand panel of the Figure.

I have had this error corrected on the glossy that I enclose herewith. I should be most grateful if you could substitute the revised glossy for the one which we sent in October. I also enclose a Xerox copy noting explicitly where the correction has been made.

I regret any inconvenience that this causes you.

Yours sincerely,



Alan H. Bridle

ANNUAL REVIEW OF ASTRONOMY AND ASTROPHYSICS

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21 October 1983

EDITOR
Geoffrey Burbidge

ASSOCIATE EDITORS
David Layzer
John G. Phillips

PRODUCTION EDITOR
Keith Dodson

Dr. Alan H. Bridle
National Radio Astronomy Observatory
Edgemont Road
Charlottesville, VA 22901

Dear Dr. Bridle:

This is to acknowledge receipt of your manuscript "Extragalactic Radio Jets," which arrived today. I very much appreciate the obvious care with which you have prepared your paper.

My estimate of the length of the article is 37 pp., which is approximately 10 pp. over the number agreed upon between you and Dr. Burbidge. I fully understand your desire to not cut the paper any further, and thus we will try to run the article at its present length. However, since we work under a very rigid page allotment, there is a possibility that we may have to request some further shortening if the volume as a whole threatens to run overlength. I will let you know as soon as possible if this turns out to be the case.

Thank you once again for your manuscript. If you should have any questions, please do not hesitate to contact me.

Sincerely yours,

Keith Dodson
Production Editor



NATIONAL RADIO ASTRONOMY OBSERVATORY

1000 BULLOCK BOULEVARD, N.W. POST OFFICE BOX 0 SOCORRO, NEW MEXICO 87801
TELEPHONE 505 835 2924 TWX 910 988 1710 VLA SITE 505 772 4011

30 October 1983

Dear Peter,

Thank you for your comments on the draft of our Ann.Rev. article. It had been sent off (deadline of October 15th) by the time we received them, but we will try to incorporate some changes at the copy-editing stage. We over-ran the page allocation by a large factor with the first complete draft, so the version we submitted is pruned substantially from the one you saw; a few of your comments were in fact dealt with in the pruning process !

I enclose two copies of the article as it was submitted. You are welcome to show this to students. As it was still over-length it may yet be shortened further, so perhaps you might warn anyone who sees it that it may be modified again.

Your comment about 6.2.2 (old p.21, new p.17) puzzles me. I would not have reserved the word "jet" for one-sided things ab initio. I see instead a continuum of phenomena that are all equally likely to be collimated outflow from active galactic nuclei, with sidedness, field configuration and degree of collimation all changing with source power. Indeed there may be two extreme types - the two-sided, B-perp dominated, slow things that feed FR I sources, and one-sided, B-parallel dominated, fast things that feed FR II's. But I think they all deserve to be called jets on the present evidence. (Obviously we don't disagree much about the physics, more about the terminology).

I heard about Ken Kellermann's data on the bright QSO sample after I had drafted the version you saw. Communication between Virginia and West Virginia can still be slow ! The hot spot data are largely Robert Laing's, though he had not inferred this particular correlation. I will urge him to publish it soon.

Jean Eilek and I are gearing up to organise a small one-week workshop on jet physics to be held at Green Bank next summer, probably in July. We would like to invite about 30 people to discuss jet systematics, sidedness and the velocity dilemma, models for collimation, bending and stability (HD and MHD) and models for keeping jets bright, in a real "workshop" format. We visualise having some prepared talks aimed at stimulating discussion in the mornings, with plenty of discussion time, leaving the afternoons free for free-form discussion or for small working groups to hammer on details. Green Bank will be the location as NRAO can provide free room and board there, as well as library and recreational facilities for anyone who would like to think on their own or simply relax during some of the week. We would be delighted if you would be interested in participating in this, and would like to invite you to lead one of the morning discussions, perhaps that on sidedness and the velocity problem. Is there any chance that you could join us ? Would some dates be better than others ?

If you might be interested in coming for a little longer, and spending some time with the group in Charlottesville before or after the workshop, I should mention that NRAO has a program of summer visitorships (which can be anything from a few weeks to a few months). I would be happy to talk with Mort Roberts about arranging one of these for you if you like - NRAO could then provide travel expenses. There would be a good sized group of people interested in extragalactic sources in Charlottesville next summer -- Craig Walker, John Benson, John Romney and Bill Cotton in the VLB group, and Bob Brown, Jim Condon, Dave Heeschen, Dave Hogg, Peter Wilkinson, Jim Ulvestad, Ski Antonucci, Chris O'Dea and myself also. On the theoretical side, Steve Reynolds and Craig Sarazin would both be there, and there would be a good flow of East coast VLA users coming by to use the AIPS systems. So I think we could offer you an interesting time.

On another matter, I am happy to say that NRAO will be expanding its scientific staff in 1984. If you know of any young radio astronomers in the U.K. who might be interested in working at NRAO, perhaps you could draw their attention to our ads in the October issues of Nature. I am acting as Chairman of a search committee for the new staff positions, and anyone with a serious interest could send their vita and the names of three referees directly to me. We will be considering applications until February 1, 1984.

With best wishes,



Alan Bridle

P.S. I'm only in New Mexico for some VLA observing -- I haven't moved yet again !

UNIVERSITY OF CAMBRIDGE

DEPARTMENT OF PHYSICS

MULLARD RADIO
ASTRONOMY OBSERVATORY

Postal address:
CAVENDISH LABORATORY
MADINGLEY ROAD
CAMBRIDGE CB3 0HE
Telephone: 0223-66477
Telex 81292

18 October 1983

Dear Alan and Rick,

Congratulations on a very clear-headed and stimulating review. I hope you don't "polish" any of the excitement out of it; the summary no-nonsense style is just right for the subject.

You asked for comments, so here are a few marginal comments I made on the way through reading it, references being to section, then page and the line number on the page of the draft Rick gave me at the VLA.

4.1 p.10 1.2-5. I'm delighted that you have taken the trouble to say this correctly. Too often one reads that jets expand sideways with their internal sound speed. But - if a jet stays free for any distance, it must become invisible, cf. 4.3. Only very dim jets, or jets with $\gamma \gg 1$, can be free.

4.1.4 p.13 1.13-14. Is it only the analysis that gets complicated - or the reality too?

1.20-21 should read "... cocoon around the jet [or "each jet"] in M84 (Figure 1) expands much faster than the jet's core beyond 5" ... ". Without the apostrophe this is a bit hard to follow.

6.1.8 p.19 1.31. Martin Gaskell (IOA) talked about a theory of this kind at Liège. Add to references?

6.2.1 p.20, end. I don't agree. As Fanti's papers show, you need rather horrifying γ 's and θ 's to explain some of the low-frequency variability. There is an alternative explanation in terms of partial focussing by irregularities in the interstellar plasma (Rickett B.J., Coles W.A. & Bourgois G. 1983 Astron. Astrophys, in press) and I think that's probably correct. It explains, inter alia, why it always happens around 500 MHz, for different quasars at all sorts of z !

6.2.2 p.21. The arguments based on weak radio galaxies with dust lanes depend on calling things like the features in M84 "jets". If one wants relativistic jets, one must exclude "jets" in FR sources. I have always held that one ought not to lump together FR1 "jets" with the rest: not only because they are two-sided, but also because they are much fatter (in terms of opening angle) than the typical FR2 jet, which, when visible at all, is generally extremely narrow (like 3C111, Cyg A, 3C219) - though there are striking exceptions (3C280.1). You seem to come round to (partial?) agreement with this point of view in 6.6, but it might clarify the state of play if the assumption were stated plainly at this stage.

6.2.2 top of p.22 - but the jet in Fig. 4 is straight - isn't that a surprise if it's strongly Doppler-boosted?

gone!

6.2.3 I do like the phrase "propagation of guilt" - please retain it!

gone.

6.3 line line of p.22 - $e^+ - e^-$, $p - e^-$... or low-frequency EM waves? We may yet have to take them seriously.

p.20
new
should
fix this.

6.5 p.23 1.24-27. This is often stated, but is a misconception. The Strittmatter et al. and Condon et al. data conflict equally with the Scheuer-Readhead and the Orr-Browne version - indeed, with any simple relativistic beaming model. After all, the optically selected quasars include the radio quasars, so the radio luminosity distribution of the radio-loud ones among them is the same according to SR or OB.

✓ ✓

Note also the new Kellermann et al. data on the PG sample, which shed rather a different light on the same question.

6.6 p.24 1.4-6. If Tony and I were right about radio cores being merely the bases of jets, then only correlations with the optical (and especially the emission line) cores are evidence of anything intrinsic.

6.6 p.24 middle. These statistics of jets vs. stronger hot spot sound interesting. I hope you'll publish the details soon.

Now that I have read the review, of course I'd like to let graduate students here see it as soon as possible. What would you be prepared to consider as a date for limited release, Alan?

Regards,

Peter Scheuer

Dr. Alan Bridle,
National Radio Astronomy Observatory,
Edgemont Road,
Charlottesville,
Virginia 22901, U.S.A.

Dr. R.A. Perley,
National Radio Astronomy Observatory,
P.O. Box 0,
1000 Bullock Boulevard N.W.,
Socorro,
New Mexico 87801, USA.



NATIONAL RADIO ASTRONOMY OBSERVATORY

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17 October 1983

Production Editor,
Annual Review of Astronomy and Astrophysics,
4139 El Camino Way,
Palo Alto,
CA 94306

Dear Sir,

I enclose two copies of the manuscript, with glossies of six Figures, for the review EXTRAGALACTIC RADIO JETS by A.H.Bridle and R.A.Perley, scheduled for vol.22 of the Annual Review of Astronomy and Astrophysics.

I estimate that the length of the review exceeds the revised page allotment by about eight pages. We have made every effort to shorten the text; this is the main reason that this manuscript is a few days late. The literature on the subject of this review has grown enormously since we agreed to review it, in mid-1982. It has also not been previously reviewed elsewhere. We have been urged by many colleagues to present a full table of jet data and a full bibliography because of the rapid development of this field. The over-run in length is primarily due to the increase in length of the main data table and of the bibliography forced on us by the rapid development of the field. As we have now numbered the references to minimise the page length, and the references interact strongly with the main data table, it will be extremely awkward and time-consuming to attempt to shorten the review still further. We therefore hope that the review will be acceptable at its present length.

Please note that the "original manuscript" is an electrostatic computer printer output in a large format that is not suitable for use by your copy editor. The Xerographic copies we have provided are more suitable for this purpose. We trust that this minor departure from your instructions is compensated by the clarity and uniformity of symbol use in the text, and the correct placement of superscripts, subscripts and math symbols.

Yours sincerely,

A handwritten signature in cursive script, appearing to read 'Alan H. Bridle'.

Alan H. Bridle

From: VAX3::RICK 11-OCT-1983 18:25
To: CVAX::BRIDLE
Subj: Comments on review by Frazer and Chris.

From Frazer I got the single comment on Section 1.1.1 (which, I bet, indicates how far he has read it). He takes offense at the last line in this section, saying that the authors quoted interpreted the head-tail phenomena in terms of discrete blobs, rather than continuous jets. He suggests rewording to emphasize 'repeated ejections', or continuous resupply of energy (which sounds like a jet to me), rather than the current wording. I replied that although the authors may have thought of 'blobs', the current reader of these papers would tend to interpret the maps in terms of continuous flow. Frazer thinks the best solution would be to delete the sentence. I don't really agree, but would not oppose deletion if you are impressed by his arguments.

From Chris, we got some more substantive comments. In Sec 3.1.1, he points out that NATs may be an exception to the rule that jets tend to be one-sided close to the core. Chris says that NATs tend to be mostly two-sided right from the core, although there are a few exceptions. In section 6.1.4, Chris points out that the jets in head-tail sources must be supersonic because the bending radius is larger than the radius of the jet. Apparently, Begelman and Rees give the equation without proof, Chris has derived it for his thesis. It is

$M = [R/(h*\gamma)]^{1/2}$. Gamma is the ratio of specific heats. Chris has also derived in his thesis the other transport equations that we give, so a reference to him might be in order (if there's room).

He found a couple of typos, but I shan't pass them on. I'll incorporate them into my 'final' list of comments.

Craig Walker is positively slavering for your comments about the meeting. He's in here every ten minutes.

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Keith Dodson

12 August 1983

To: Authors, Annual Review of Astronomy and Astrophysics, Volume 22

From: Keith Dodson, Production Editor

A final reminder---your article for Volume 22 of the Annual Review of Astronomy and Astrophysics is due in this office October 15, 1983. We urge you to make every effort to meet this due date and to keep your manuscript within the page allotment of 20 printed pages (including bibliography, illustrations, and tables). We cannot guarantee publication of late or overlength manuscripts.

Enclosed is a checklist for use in the final preparation of your manuscript. For further details, please refer to the author instruction booklet sent to you earlier. Please plan to send the original and one copy of your manuscript. In addition, it would be helpful to us if you could fill out the enclosed postcard and return it to this office by October 1.

Thank you very much for your efforts---we greatly appreciate the work involved. We look forward with pleasure to receiving your manuscript.

Note: This was typed before we received your request to increase the page allotment by 1/3; Dr. Burbidge will be sending you a separate letter agreeing to your proposal.
Keith D.

ANNUAL REVIEW OF ASTRONOMY AND ASTROPHYSICS

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EDITOR

Geoffrey Burbidge

ASSOCIATE EDITORS

David Layzer
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PRODUCTION EDITOR

Keith Dodson

11 August 1983

Dr. Alan Bridle
National Radio Astronomy Observatory
Edgemont Road
Charlottesville, VA 22901

Dear Alan:

Thank you for your letter of August 4 asking if your article on "Extragalactic Radio Jets" for Volume 22 of the Annual Review of Astronomy and Astrophysics could be increased in length by about one-third. I think you have made a good case for this, and thus we are prepared to allow you such an extra page allocation.

Please note that I still expect to receive the review on or before October 15, 1983.

With best wishes.

Yours sincerely,

Geoffrey Burbidge
Editor

GB/fed

cc: K. Dodson



NATIONAL RADIO ASTRONOMY OBSERVATORY

EDGEMONT ROAD CHARLOTTESVILLE, VIRGINIA 22901
TELEPHONE 804 296 0211 TWX 510 587 5482

4 August 1983

Dr.G.R.Burbidge,
Editor, Annual Review of Astronomy & Astrophysics,
Annual Reviews, Inc.,
4139 El Camino Way,
Palo Alto, CA 94306

Dear Geoff,

This is to ask if the allocation of space in Volume 22 for the article on "Extragalactic Radio Jets" might be increased. Much data on extragalactic jets (about 180 are now known) is unpublished, and what is published is widely scattered. I have been collecting the (published and unpublished) VLA, MERLIN and VLB jet maps for several years now; most of the active observers in the field have contributed data to this collection in return for examining it themselves. Many have urged me to summarize this database in a table for the review, and I agree that this would be very worthwhile. I do not however think I can do this, show the typical phenomena with maps, cover the conceptual ground, and provide a full bibliography, all within the 20-page allocation. I should therefore be grateful if the allocation could be extended, perhaps by about 1/3.

I hope that it is not too late to make an adjustment of this nature.

Please note that I am now working at the address on this letterhead, which should be used as my mailing address for any correspondence regarding the article.

Yours sincerely,

Alan Bridle

Physics Department
MIT Rm 4-340
Cambridge, MA 02139

29 June 1983

Dr. A. H. Bridle
NRAO
Edgemont Road
Charlottesville, VA 22901

Dear Dr. Bridle:

It recently came to my attention that you are preparing a review on "Extragalactic Radio Jets." I have been working with Philip Morrison on the jet from 3C273, and enclose preprints on our recent results.

Our major conclusions are: 1) The jet from 3C273 is probably a young, proton-electron (not positron-electron) beam; 2) The reacceleration picture for the source of high-energy electrons for the extended radio source in 3C273 has great difficulties explaining the observations, thus making a search for other models worthwhile; and 3) It is possible that the source for the high-energy electrons is inelastic collisions between the jet protons and ambient protons, provided that a high degree of clumping takes place in the interaction.

I hope you find these papers useful. Thank you for considering them.

Sincerely,

Dana Roberts

Dana Roberts



NATIONAL RADIO ASTRONOMY OBSERVATORY

EDGEMONT ROAD CHARLOTTESVILLE, VIRGINIA 22901
TELEPHONE 804 296 0211 TWX 510 587 5482

24 May 1983

Dr. T.W.B. Muxlow,
Nuffield Radio Astronomy Laboratories,
Jodrell Bank,
Macclesfield,
Cheshire SK11 9DL,
U.K.

Dear Dr. Muxlow,

Thank you very much for the glossy of your map of 3C418, which I received here today. We are most grateful to you for providing this in advance of its publication.

We are now beginning to put the text of our review together, and I hope to have a rough draft in time for the Bologna Meeting. Will you be attending that? If so, I will look forward to meeting you there.

I have been putting together a compilation of abstracts of papers relating to extragalactic jets. I am about to update it again, but enclose a copy as it may be of interest to you in its present form.

With best wishes,

A handwritten signature in cursive script, which appears to read 'Alan Bridle', is positioned above the typed name.

Alan Bridle

UNIVERSITY OF MANCHESTER
NUFFIELD RADIO ASTRONOMY LABORATORIES



TELEPHONE:
LOWER WITHINGTON 71321

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TELEX 36149

JODRELL BANK
MACCLESFIELD
CHESHIRE
SK11 9DL

17th May 1983

Professor Alan Bridle
N.R.A.O.
Edgemont Road
Charlottesville, Va. 22901
U.S.A.

Dear Professor Bridle,

Please find enclosed a copy of the 3C418 18 cm MERLIN/EVN map as requested for inclusion in your review article. I am solely responsible for the production of the image; however, it will be published along with some attempted explanation of its structure in a paper with Michel Jullian and Roger Linfield. Thus you would do best to refer to it as Muxlow et al. in preparation. The paper is intended to go to Monthly Notices this summer, and may pre-date your article. If so, I will send you a preprint and advise you to change the reference to "in press".

I would appreciate an advance draft of the review when it becomes available. I trust that this will be satisfactory.

Yours sincerely,

Dr. T. W. B. Muxlow

TWBM/JWA

Encl.



NATIONAL RADIO ASTRONOMY OBSERVATORY

EDGEMONT ROAD CHARLOTTESVILLE, VIRGINIA 22901
TELEPHONE 804 296 0211 TWX 510 587 5482

2 May 1983

Dr. T. Muxlow,
Nuffield Radio Astronomy Laboratories,
Jodrell Bank,
Macclesfield,
Cheshire SK11 9DL,
U.K.

Dear Dr. Muxlow,

Rick Perley and I are writing a review article on 'Extragalactic Radio Jets' for the 1984 Annual Review of Astronomy and Astrophysics. We hope to illustrate the variation of jet properties with radio core luminosity (their sidedness, bending, etc.) by showing maps of jets in sources with as wide a range of core luminosities as possible. The most luminous core we know that is associated with a jetlike structure is that in 3C418. We have been shown a very fine 18cm MERLIN/EVN 9-station map of this source at 80 mas resolution, and were told that you are the author or a co-author. This is to enquire whether you (and your colleagues, if any) would be prepared to provide a copy of this map for inclusion in our review as part of the documentation of the luminosity dependence of jet properties. If so, perhaps you could send a copy of the map suitable for rephotography to me at this address, indicating also how you would like the authorship of the data to be referenced.

We would be happy to provide you with an advance draft of the review so that you could see the context in which the map was shown.

With best wishes,


Alan Bridle

Scarborough College
University of Toronto

Physical Sciences Division

West Hill, Ontario
M1C 1A4

April 7, 1983

Dr. A.H. Bridle,
National Radio Astronomy Observatory,
Edgemont Road,
Charlottesville, Virginia 22091
U.S.A.

Dear Alan,

Thanks for your letter of 21st March, and in reply I am enclosing a contour map of 3C9, 3C270 and 3C303 at $\lambda 6$ cm.

I also enclose a reprint of Biermann, Kronberg and Madore describing the detection of hot gas in the TG39a group of galaxies, and a similar detection for the elliptical galaxy NGC5846 by Peter Biermann and me which will appear shortly. These are among the very first detections of hot gas in such small clusters, and among other interesting implications they have, they provide the right sort of pressure to confine jets.

I hope this is helpful; do not hesitate to contact me again if I can help further.

With best wishes,

Sincerely yours,



Phil Kronberg

Encl.





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21 March 1983

Dr.P.P.Kronberg,
Scarborough College,
University of Toronto,
West Hill,
Toronto, Ontario M1C 1A4.

Dear Phil,

Rick Perley and I are preparing an article for the 1984 Annual Review of Astronomy and Astrophysics, on "Extragalactic Radio Jets". In an effort to document the systematic and statistical properties of the jets, we are assembling data on a list of 102 definite and 45 possible jets, most of which have been observed at the VLA. We are writing to several people who have VLA observations of jets in this list to ask if they will send us data for statistical purposes. We are particularly interested in (a) 5 GHz flux densities of unresolved central cores in jet sources, (b) estimates of brightness ratios between jet and counter-jet emissions, (c) estimates of the total lengths of jets (core to jet termination in arc seconds), and (d) information on jet magnetic field configurations. We hope to explore more thoroughly the correlations between core power, total power, jet sidedness, field structure, and source symmetries which were described in a preliminary way in my review at IAU Symposium No.97.

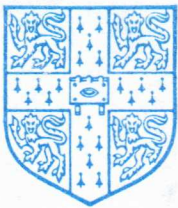
We have been told that you have VLA data on jets or jetlike structures in 3C9, 3C270, and 3C303, and would be most grateful if you would share these aspects of the data with us for the purposes of our review. We will not attempt to make any interpretation of individual sources on the basis of data communicated to us in this context. Copies of contour maps of the sources would, of course, be greatly appreciated, as these would allow us to measure quantities in a uniform way throughout the whole source list. Any contour maps we receive will be used only to derive the quantities of statistical interest to us. Full credit will, of course, be given for use of the data.

As part of our literature review, we are compiling a collection of abstracts of observational papers pertinent to the jet phenomenon. I enclose the current working version of this in the hope that it will be of use to you. We will also send early copies of the review to all who send us data, so that they will be able to comment on the use we have made of it.

With best wishes,

A handwritten signature in cursive script, appearing to read 'Alan Bridle'.

Alan Bridle



UNIVERSITY OF CAMBRIDGE
INSTITUTE OF ASTRONOMY

Address: Institute of Astronomy, The Observatories, Madingley Road, Cambridge, CB3 0HA, England
Telephone: Cambridge (0223) 62204. Telex: 817297 ASTRON G. Telegrams: Observer Cambridge UK

13 October 1982

Drs A.H. Bridle and K.A. Perley

Dear Alan and Rick,

Thank you very much for your circular about your proposed article for Annual Reviews. Several of us here are working hard on topics relevant to jets, and I will be sure that you get preprints as they are completed. I am myself supposed to be writing an article for the same issue of Annual Reviews on the topic of 'Galactic Nuclei'. There is likely to be a bit of overlap, since both of us are going to be concerned with the initial collimation of jets. I probably will not get down to any serious writing until next summer, but it would be good if we could keep in touch, so as to make sure that our articles mesh together well.

With best wishes,

Yours sincerely,

A handwritten signature in black ink, appearing to be 'MR' or similar initials, written in a cursive style.

Martin Rees



DEPARTMENT OF PHYSICS
STIRLING HALL

1 November 1982

Queen's University
Kingston, Canada
K7L 3N6

Dear Colleague,

We have been asked by the editors of the Annual Review of Astronomy and Astrophysics to prepare a review on "Extragalactic Radio Jets" for the 1984 volume. This review will be submitted by October 1983. In order to make it as comprehensive and useful to the community as possible, we would be happy to receive reprints or preprints of new observational or theoretical results on extragalactic jets. We will terminate our own literature search for this review in July of 1983 and will also attempt to take proper account of any preprint material we receive before then.

Our postal addresses are:

A.H.Bridle (until 31 December 1982)
Department of Physics,
Queen's University,
Kingston, Ontario K7L 3N6,
Canada

A.H.Bridle (after 1 January 1983)
NRAO,
Edgemont Road,
Charlottesville, VA 22901,
U.S.A.

R.A.Perley,
NRAO VLA Program,
P.O. Box 0,
Socorro, NM 87801,
U.S.A.

We look forward to hearing from you,

Alan H. Bridle

R. A. Perley

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July 22, 1982

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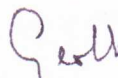
Dr. Alan H. Bridle
VLA Program
National Radio Astronomy Observatory
P.O. Box 0
Socorro, New Mexico 87801

Dear Alan:

It was indeed a pleasure to learn that you accept our invitation to prepare a chapter on Extragalactic Radio Jets for Volume 22 of the Annual Review of Astronomy and Astrophysics. We are grateful to you for agreeing to undertake this task, and we are happy to welcome Dr. R. A. Perley as your coauthor.

Instructions to help in the preparation of the manuscript are enclosed. The Production Editor, Keith Dodson, will send you the complete panel of topics and authors for the volume as soon as it is available.

Sincerely,



Geoffrey Burbidge
Editor

GB:bt
Encl. Instruction booklet

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17 June 1982

Dr. G.R.Burbidge,
Editor,
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Annual Reviews, Inc.
4139 El Camino Way,
Palo Alto,
CA 94306

Dear Geoff,

Your letter of 25 May inviting me to write a review on "Extragalactic Radio Jets" for the Annual Review of Astronomy and Astrophysics, Vol. 22, has just been forwarded to me here from Queen's University. (I am at the VLA on leave until the end of August).

I am happy to accept your invitation, and will co-author the review with Dr. R.A.Perley of NRAO. Your suggested title is fine.

Yours sincerely,



Alan H. Bridle

ANNUAL REVIEW OF ASTRONOMY AND ASTROPHYSICS

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25 May 1982

Dr. Alan H. Bridle
Department of Physics
Queens University
Kingston, Ontario K7L 3N6
CANADA

Dear Alan:

On behalf of the Editorial Committee of the Annual Review of Astronomy and Astrophysics, I would like to invite you to prepare a review entitled "Extragalactic Radio Jets" which will be scheduled for Volume 22. Please feel free to change the wording of the title and/or choose a co-author if you wish.

You are probably familiar with the format and content of Annual Reviews. Each chapter is a review and critical analysis of the present state of a specific field contained in a relatively brief article. You may wish to bear in mind that many of your readers will be astronomers and scientists who are not specialists in your own field and therefore require a certain amount of historical background and explanation of specialized terms.

We have reserved 20 printed pages (approximately 10,000 words), including bibliography, tables, and illustrations, for your chapter which will be due here on October 15, 1983. Volume 22 is scheduled for publication on September 15, 1984. Financial considerations require that we adhere quite closely to the total page allotment for each volume; therefore, any substantial increase in the size of your chapter must have the advance approval of the editor.

The policy of Annual Reviews, a nonprofit corporation, does not permit us to provide honoraria to contributors. We are authorized, however, to offer you a five-year complimentary subscription to the Review and 200 reprints of your article, to be divided among co-authors.

We very much hope that you can accept this invitation and look forward to hearing from you soon.

With best wishes.

Yours sincerely,



Geoffrey Burbidge
Editor

GB/fed
cc: K. Dodson