1 A Reference Sample

"3CRR", defined by Laing, Riley & Longair (1983), is the best-studied complete sample of extragalactic radio sources. All 173 members have secure redshifts and most have been imaged at high resolution with WSRT, MERLIN or the VLA. There is also copious information on their powerful optical line emission, and many have been detected in the sub-mm, FIR, and in X-rays. 3CRR is widely used as a baseline against which fainter, higher-redshift samples can be compared to define the evolution of the population (e.g. Neeser et al. 1995; Law-Green, this conference).

At present, modern radio data on 3CRR is partly unpublished and the rest is spread across many papers. The digital images are not easily accessible, which hinders systematic morphological analysis. The *Atlas* project with solve half this problem.

2 The Atlas

Our *Atlas of Extragalactic Radio Sources* will be available both in printed form and on Compact Disc. It wil contain high-quality images of the **nearer half** of 3CRR. Many of these images have been contributed by other observers (see Section 5).

The sample is defined as follows:

Extragalactic
$S_{178\mathrm{MHz}} \geq 10.9$ Jy
$\delta \geq 10^\circ$
$b^{II} \geq 10^\circ$
Defines the 3CRR sample.

We also require

$$z \leq 0.5,$$

and exclude the starburst galaxy 3C 231 (M 82), to give 85 members, all DRAGNs. The high-redshift part of 3CRR is excluded mainly because high-resolution images of the large majority are available in a single project, (Laing & Owen, unpublished).

The *Atlas* images have:

Beam FWHM $\leq 5\%$ of the target largest angular size.
(Typically FWHM $\sim 2.5\%$ of LAS.)

Sensitivity and uv-coverage sufficient to show the largest and faintest components in each DRAGN.

Wavelength 20 cm in most cases.

Telescope WSRT, VLA, MERLIN or EVN as appropriate for the DRAGN's angular size.

The *Atlas* will also contain tables of basic data on each source, including flux densities from 10 MHz to 1 keV, and basic morphological data derived from the images. We are investigating the possibility of including optical spectra for each source. We would welcome the opportunity to include any other data which has been systematically collected for a large part of the sample; please could anyone interested in collaborating contact Patrick Leahy.

3 Current Status

Images of 80 of 85 sample members are now in hand. We are obtaining data for the remaining five, all of large angular size, from the WSRT archives. In a few more cases the images we have do not meet (or barely meet) our target criteria, and improved images are being produced. Distribution on CD should occur in 1996 as part of the NRAO CD series; publication in print may be some time later. Some images recently made for the project are shown in Fig. 1. All the images to date are attached to this poster.

4 Preliminary Results

We have **classified** the objects into the following types, as in Law-Green et al. (1995):

FR I this covers the twin-jets and WATs of Law-Green et al.There are 14 in our sample. Only 1227+119 is marginally above the nominal FR break power. All have two jets except for 3C 264 which is one-sided.

PD (I/II) Peculiar doubles with highly distorted lobes, apparently due to interaction with clouds of cool gas (9). All but 3C 305 are well above the FR break, but 3C 171 and 3C 288 are nominally FR I.

Fat double Lack hotspots or prominent jets. Of the 9 in the atlas 4 have jets. Radio powers scatter around the FR break.

Core-Halo Objects with a steep-spectrum (kpc-scale) component (not just a jet) at the centre of a much larger DRAGN. There are five. Large-scale components range from amorphous (Vir A), to classical double (3C 236).

D (II) classical double with hotspots near the outer ends and fairly linear structure. All but 3C 98 are above the FR break; all are FR IIs.

Jetted double Non-classical FR IIs containing bright, hotspotless jets: 3C 48, 200, 346, 401.

A number of these objects have been classified by others as "compact steep spectrum", but not in any physically consistent way, and we prefer to avoid the term. The smallest objects in the sample are 3C 48 (JD), 3C-,268.3 & 67 (D), 3C 305 (PD), and 3C 272.1 (I).

The distribution of the sample members in the **P-D** (radio power – linear size) plane is shown in Fig. 2.

Cores are detected in 78 sample members, and a further two show jets which blend together at the centre, masking the potential core position. Not all these cores are visible in the *Atlas* images. The few objects with missing cores have usually not been observed to sub-mJy levels at high frequency; the exception being the peculiar fat double 3C 16. Cores are thus essentially ubiquitous.

Jets are detected in 50 DRAGNs (59%). This is not surprising as the sample contains 21 objects with luminosities below the FR break, and of these only three lack jets (the fat doubles 3C 386 and 3C 442A, and the giant DA 240). There are also 5 quasars, all showing jets. Thus 27 of the 59 powerful radio galaxies show jets (46%), with another 6 with possible jets. Twelve, possibly thirteen of these show jets on both sides, suggesting that jets are much less one-sided in powerful radio galaxies than quasars.

We have re-examined some well-known **morphological trends**. The tendency for hotspots to become more prominent with radio power is weakly confirmed (see poster by Duncan Law-Green, this conference). The trend to higher axial ratio with power is also confirmed. With all the data in hand, we hope to address the knotty problem of defining "hotspot" in a useful way, so that properties such as the size, power, and perhaps more detailed structural characteristics of hotspots can be studied in an objective way.

5 Contributors

C.E. Akujor
A.R.S. Black
G. de Bruyn
W. van Breugel
J.O Burns
W. Christiansen
D.A. Clarke
N. Comins
C. Fanti
R. Fanti
L. Feretti
E.B. Fomalont
J.P. Ge
G. Giovannini
P.P. Kronberg
R.A. Laing
E. Lüdke
T.W.B. Muxlow
C.P. O'Dea
A. O'Donoghue
F.N. Owen
P. Parma
A. Pedlar
R.A. Perley
H. de Ruiter
S.R. Spangler
G.B. Taylor
P.N. Wilkinson
A.G. Willis

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