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The role of relativistic bulk motions in determining apparent side-to-side asymmetries in double radio sources will be studied in three ways.

First, the VcA will be used to study the spectral index and depolarization asymmetries of the lobes in a sample of powerful double-lobed radio galaxies with detected radio jets. A previous study of such asymmetries in a sample of 3CR quasars with one-sided radio jets has shown that the features with high surface brightness have systematically flatter radio spectra in the jetted lobe, whereas the features with low surface brightness have systematically flatter spectra in the longer lobe. Both of these effects have important consequences for radio source models that attribute such asymmetries to relativistic effects. The high-brightness correlation mimics the depolarization asymmetry seen in radio-loud quasars. It shows that whatever causes the jet-sidedness asymmetry in such quasars extends beyond the jets into the brighter parts of the lobes. In conventional models the vector for this asymmetry is bulk relativistic flow, and the extension of such flow into the lobes is surprising unless at least part of the flow in the jets has higher Lorentz factors than had hitherto been suspected. The low-brightness correlation mimics the length-related depolarization asymmetry seen in powerful radio galaxies. It shows that some lobe asymmetries are independent of jet sidedness and may reflect asymmetries in the gaseous environments of the sources. It is important to determine whether these two correlations are replicated in a sample of powerful double-lobed 3CR radio galaxies, as well as in the quasar sample. The extent to which they appear in both radio galaxies and quasars is a new test for relativistic-jet models, and for proposed unifications of these radio-loud source populations.

Second, the fine structure of the total and polarized intensity of the jet and counterjet in the low-power radio galaxy 3C31 will be determined from sensitive, high-resolution VLA observations at several frequencies. 3C31 is the brightest and best-resolved example of a twin-plumed radio source with a strong brightness asymmetry in its first few kiloparsecs. Several lines of evidence now point toward a model of radio jets in which an inner, ultrarelativistic, highly-collimated spine surrounds itself with a boundary layer or sheath in which flow velocities decrease outwards from the spine. In this model, many asymmetries in both plumed and double-lobed sources may be attributed to differences in the longitudinal deceleration of the spine and of the sheath, and by orientation-sensitive aspects of both parts of the flow. 3C31 is a particularly good laboratory in which to test such spine-sheath models. The counterjet and the symmetric components of 3C31's jet should be emission from the slower-moving sheath, whereas the bright one-sided inner base of the jet should arise from the decelerating spine. The model predicts strong relationships between the intensity asymmetries, apparent magnetic field configurations, polarized intensity and depolarization distributions across 3C31. These will be tested in detail.

Third, the VLBA will be used to seek evidence that even a low-power radio galaxy can contain a jet with a relativistically-moving spine. The compact features at the base of the jet in the weak, twin-plumed radio source in the Virgo cluster elliptical M84 will be imaged at several epochs to determine, or set limits to, their apparent proper motions.

High-resolution VLA imaging and polarimetry of the filamentary lobes of the radio galaxy 3C353 will continue. This study will show whether the many-kiloparsec-scale filaments throughout the lobes of a moderately-powerful radio galaxy are systematically distinguished from other emission by spectral index, spectral curvature (ageing), or degree of polarization. Models for the origin and evolution of large-scale filamentation in radio sources presently encounter very few observational constraints. The mechanism for the filamentation is therefore unclear, though its consequences for source energetics and confinement may be considerable.

A digital "Atlas" containing VLA, MERLIN and WSRT imaging of a complete sample of nearby 3CR sources is being completed by new MERLIN and WSRT observations of the sample's most compact and most extended members. This Atlas will be made available to the astronomical community as soon as possible.