LONG BASELINE OPTICAL INTERFEROMETRY

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During the last three years significant results have been obtained from several operational, long baseline optical interferometers. Precision stellar angular diameters (accuracy of order 2% and better) have been reported in the infrared (DiBenedetto and Rabbia, 1987) and in the visible (Davis and Tango, 1986). Astrometric precision of order 20 milliarcsec has been demonstrated over large angles (Shao *et al.*, in press). Spectro-spatial resolution of the disk of a Be star in the hydrogen emission line (Thom *et al.*, 1986) suggests spectacular imaging science to come with many-telescope coherent and phased optical arrays.

Stimulated by such results, by the success of radio telescope arrays, and by rapid progress in control, detector, and optical fiber technology, a large number of interferometer projects have been initiated. The accompanying table summarizes the information currently available to me concerning these projects. It seems quite remarkable that by the year 1995 we may have more than 15 operational optical interferometers.

The first instruments coming on-line during the next five years provide a capability for the measurement of accurate stellar diameters for samples of most spectral types, will provide direct observations of stellar pulsations in many variable types, will provide elementary imagery of circumstellar material in a variety of early and late type stars, especially including disks around YSO's, will yield direct orbit determination for large numbers of spectroscopic binaries, will provide precision astrometry of large numbers of bright stars, and many other applications will surely be demonstrated.

The capital investment in long baseline optical interferometry is significant. Nevertheless, most of the long baseline plans involve small numbers of apertures, hence are not well suited for imaging, and the few many-aperture instruments are limited by cost constraints to very small telescopes, hence bright limiting magnitudes. Thus these projects, ambitious though they may appear, are primarily a proving ground, where astronomers will master the techniques for the ground and space observatories of the next century.

References

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Shao, M.*et al. Astron. Astrophys.* (in press).
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D. McNally (ed.), Highlights of Astronomy, Vol. 8, 559–560.

TELESCOPE ARRAY PROJECTS[1]

Project Name (Center or Location)	Telescopes No.	Diameter (cm)	Baseline (m)	Array Shape	Status Notes
(Interferometric Operation Demonstrated)					
I2T (CERGA)	2	25	144	N-S	1
G12T (GERGA)	2	150	70	N-S	2
MMT (Mt. Hopkins)	6	180	6.8	Hexagon	3
Mark III (Mt. Wilson)	2	7.5	12	N-S	4
SUSI-Prototype (U. Sydney)	2	10	11.4	N-S	5
SOIRDETE (CERGA)	2	100	15	E-W	6
(Funded for Construction)					
SUSI (U. Sydney)	2	14	640	N-S	5
Optical IF (U. Erlangen)	16	11	7.5	Line	
Distributed Array (NOAO)	5	60	100	Star	7
IRMA (U. Wyoming)	2	10	15	N-S	8
IOTA (CFA)	2	45	50	N-S	9
COAST (Cambridge)	4	40	100	Y	10
VLT (ESO)	4	800	150	Linear	11
Astrometric IF (SAO)	3	100	20		12
Imaging IF (SAO)	6	60	100		13
(Planned)					
Columbus (U. Arizona)	2	800	22	Rot. Line	14
CHARA array (Georgia State U.)	7	100	400	Cobweb	15
VISIR (France)	3	150	300	Cross	16
OVLA (CERGA)	27	150		Platform	17
NNTT (NOAO)	4	800	22	Square	18

1. I2T - Baseline extended, new lab. telescopes being refurbished for remote operation.
2. GI2T - Operation interrupted for drive mods., new computer and correlation system.
3. MMT - All reflective beam combiner; coherent speckle; phased operation planned.
4. Mark III - install baselines up to 30 m, improvements in limiting mag.
5. SUSI - Prototype closed after successful tests; first light expected early for SUSI.
6. SOIRDETE - A recent, experimental modification of an existing 2-telescope facility.
7. NOAO - Construction of first 2 telescopes suspended due to NOAO budget reductions.
8. IRMA - First light expected in August 1988.
9. IOTA - Contracts for telescope fabrication to be committed soon; assembly in 1989.
10. COAST - two telescopes funded and under construction.
11. VLT - funded detailed interferometric beam combination plan not yet developed.
12. Astrometric IF - Hope to reach quasars; telescope diam. cost factors under study.
13. Imaging IF - 6 t'scope for phase and amp. closure; t'scope diam/cost under study.
14. Columbus - Detailed design study in progress, some funding already committed.
15. CHARA - Detailed design study in progress, some funding already committed.
16. VISIR - Engineering study at IRAM of telescope designs for interferometry.
17. OVLA - One of several concepts with many innovative features.
18. NNTT - Suspended after years of design, due to slim prospects for early funding.

[1] A collection of project descriptions like this is certain to contain some errors, if only because plans change. I apologise in advance for any inaccuracies which I have introduced.

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