Center for Astrophysics

Harvard College Observatory
Smithsonian Astrophysical Observatory

MEMORANDUM

To: Nat Carleton

Date: 26 December 1974

From: Dave Latham

Subject: Science Center Telescope

I inspected the Fecker telescope at the Galileo Observatory in Bucyrus, Ohio on 19 December 1974. The telescope appears to be well designed, well made, and well preserved. However, it has not been used in more than ten years, and a major relubrication and cleaning should be carried out before the telescope is put into routine operation.

The telescope and Ross Camera seem well suited to undergraduate use at the Science Center. I estimate that the total direct cost of getting the telescope into operation on the Science Center might be held to as little as $25,000, and the annual cost of operation to be about $1,500, including a 1/5-time graduate student. These estimates are in 1974 dollars and do not include any indirect costs.

Description of the Telescope. The primary instrument is a Fecker refractor of 10-inch aperture and f/15 focal ratio, corrected for the visual. Mounted securely to the main telescope is a Ross-Fecker astrographic camera of 3-inch aperture and about f/7 focal ratio with a 5 x 7-inch plateholder. A finding telescope of 3-inch aperture is also mounted securely to the main telescope.

Although no direct evidence on the quality of the optics and tracking is available, my impression is that all three of the telescopes were designed and manufactured to the highest professional standards of the early 1950's. The telescope has not been used for more than ten years, and is in a "moth balled" condition. Thus it was not possible to check the optical and tracking performance directly by astronomical observations.

The telescope has motor-driven guide motions of both declination and right-ascension, controlled from a hand-paddle. The main worm wheel is about 30 inches in diameter, and the gearbox that drives the worm has been well protected and appears to be in excellent condition. The declination guiding is accomplished by a screw on a tangent arm of about 24-inches length. Slewing is by hand on both axes. The clamps for the axes are operated electrically from the hand paddle. Controls for the dome motion are also available on the hand paddle.

The main telescope tube is about 12.5 feet long, and the pedestal on which it is mounted is a massive iron casting which rises about 10 feet off of the floor, so that the intersection of the right-ascension and declination axes is about 11.5 feet above the floor. The overall impression of the telescope is that it is massive and substantial. I estimate that the total weight of the telescope and pedestal is on

the order of 2 or 3 tons.

Access to the eyepieces is provided by an excellent roll-around stair ladder, which comes with the telescope.

Both axes are provided with excellent engraved setting circles. The diameter of the declination circle is about 40 inches, of the right ascension circle about 24 inches.

The present value of the telescope is perhaps $20,000.

Suitability for undergraduate observing at the Science Center. I agree with the philosophy that every student who comes through the doors of the Science Center should be encouraged to look through a decent telescope at astonomical objects such as planets (e.g. the rings of Saturn, the moons of Jupiter, the phases of Venus, the polar caps of Mars, the disc of Uranus), the moon (e.g. craters and mountains), the sun (e.g. sunspots with a projection screen),star clusters, the orion nebula, planetary nebulae, and binary stars. I think the 10-inch Fecker, which is visually corrected, would work very well for this type of casual observing, assuming that a supervisory person is present. Presumably this would be a graduate student hired specifically for this job, nominally at 1/5 time. This would be sufficient to allow several open nights a month, to which students in general would be urged to come.

The Fecker telescope has an important advantage over a smaller portable telescope, namely that it should be very much easier to find objects because of the fine setting circles. It also should track well enough so that very little, if any, guiding is necessary during open-night sessions.

One might argue that the telescope would be rather awkward for casual observing because of the large swing of the eyepiece that may mean climbing up on the observing stair-ladder. In the case of the present telescope I don't think this is a real disadvantage, because an excellent stair-ladder comes with the telescope. I am even inclined to argue that clambering up to the eyepiece would add to the fun and excitement of using the telescope. One certainly gets the impression that this telescope is the real thing, standing majestically on top of its massive pedestal.

Because of the 3-inch Ross Fecker astrographic camera, this telescope could provide a facility for taking long-exposure photographs of objects such as asteroids, Pluto, satellites of planets, star clusters, and a few of the brightest nebulae. Thus the installation could be used for more serious observing projects associated with regular courses. When taking photographs with the astrographic camera, the main 10-inch telescope is used for guiding. This means that excellent tracking and thus excellent images should be possible. At present it is not

possible to take long telescopic exposures with equipment in Cambridge. The astrographic camera takes 5 x 7 inch plates, and this implies a moderate extra cost for photographic plates and planning ahead on the purchase of the plates, which have a several-month delivery. It also implies a one-shot expenditure to set up the darkroom for developing these plates.

There is also a class of photographic observations of bright objects, such as the moon and planets, which require a long focal length but only short exposure times. The 10-inch telescope could be provided with a 35-mm camera back and adaptors necessary for such exposures for a moderate one-shot expenditure.

Because of the rather bright sky in Cambridge, deep exposures of objects such as galxies and nebulae would not be possible from The Science Center. For the past three years, the Agassiz Station of Harvard College Observatory has been used by about 15 undergraduates a year for this kind of serious photography with excellent success. Presumably this program of observing at Agassiz will continue to be available, and would complement the observing at the Science Center.

Similarly, projects which require a stellar photometer or stellar spectrograph would best be done from Agassiz Station, where professional equipment is available.

A 9-inch refractor on the roof of the observatory at 60 Garden Street is presently used by the astronomy courses for some casual observing and a few projects of short-exposure photography. This telescope does not have a long-exposure capability because of poor tracking and guiding facilities. Nevertheless, some of the astronomy courses might choose to continue to use the 9-inch for their projects, simply because the graduate-student teaching fellows have their offices in the observatory and are much more likely to be available for help at the observatory.

<u>How much would it cost?</u> I have worked up some estimates of the cost to bring the telescope to Cambridge and put it into operation in the Science Center. Since my estimates of the total direct costs are three times smaller than the most recent previous estimates, I have attached a detailed summary.

All costs are in 1974 dollars, and do not include indirect costs such as overhead or salaries of scientific staff who supervise and advise.

The biggest single cost item is the dome. The estimates shown are a quote from Ash Manufacturing of Plainfield, Illinois. I have had extensive experience with Ash and their domes, and I am confident that their product is suitable for this application.

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I am uncertain as to the role of Buildings and Grounds in such a project - they have not returned my calls. Past experience makes me very wary of these people. The fee they will want is one of the biggest uncertainties in my estimates.

Dome		
	Shipping	$16,028.
	Erection supervision	975.
	Lift to roof	387.
	Erection labor (4 men, 3 days)	200.
	Electrical connections	600.
	Prepare roof for dome	150.
		1,000.
		$19,340.
Telescope		
	Trucking, Bucyrus to Cambridge	750.
	Riggers and crane, Bucyrus	250.
	Packing to protect telescope	200.
	Riggers and crane, Cambridge	350.
	Mounting plate to adapt pedestal to Science Center pier	500.
	Electrical connections	100.
	Lubrication and cleaning	500.
	Eyepieces	100.
	35 mm camera back and adaptor	200.
	Darkroom equipment	200.
	Travel of scientific supervisor	300.
		$ 3,450.
Observing room preparation		
	Add proper lighting and controls	250.
	Sidereal clock	150.
	Desk and chart table	500.
	Storage cabinets	250.
		$ 1,150.
Buildings and Grounds supervision		$ 750.
Grand Total, direct costs only		$24,690.
Annual Operating Costs		
	Photographic supplies	$ 300.
	1/5-time graduate student	1,200.
		$ 1,500.

DWL/cjb

12/31/74