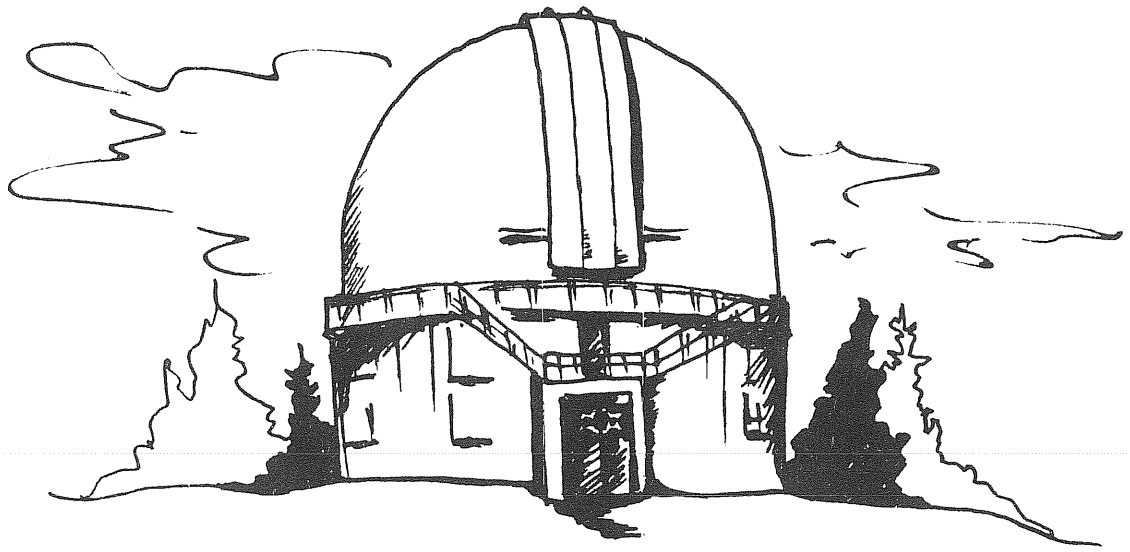

DAVID DUNLAP DOINGS

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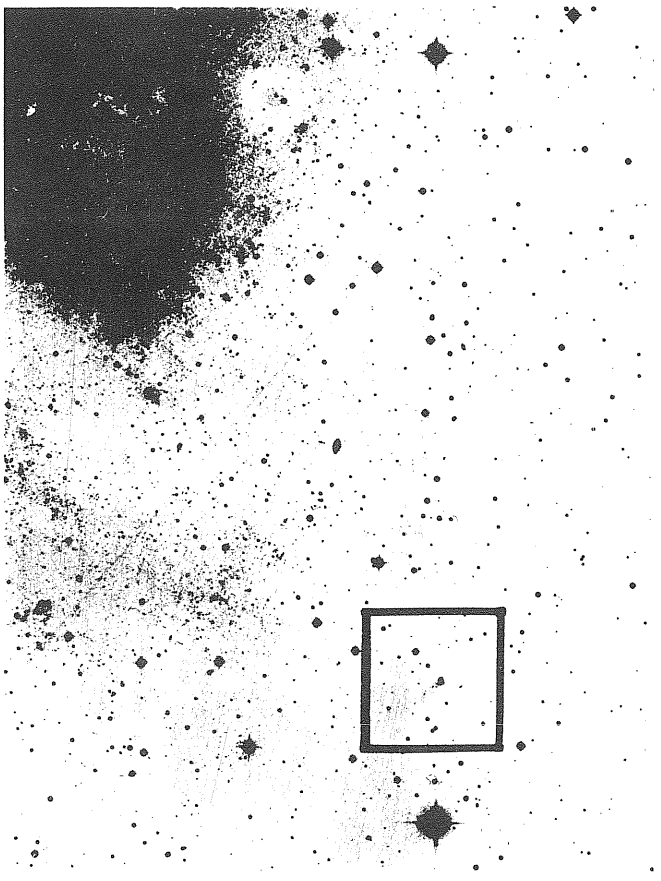

Circular No. 2719

CENTRAL BUREAU FOR ASTRONOMICAL TELEGRAMS
INTERNATIONAL ASTRONOMICAL UNION

POSTAL ADDRESS CENTRAL BUREAU FOR ASTRONOMICAL TELEGRAMS,
SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MASS 02138 USA
CABLE ADDRESS SATELLITES, NEWYORK - WESTERN UNION RAPID SATELLITE CAMBMASS

COMET VAN DEN BERGH (1974g)

Dr. M. Schmidt, Hale Observatories, reports that Dr. Sidney van den Bergh has discovered a comet, as shown below. The comet is diffuse, without condensation or nucleus, but with a short tail. Observations have also been made by C. Y. Shao and G. Schwartz at Harvard College Observatory's Agassiz Station.

1974 UT	α_{1950}	δ_{1950}	m_1	Observer
Nov. 12.22917	$1^h32^m39^s$	+30°56'09"	17	van den Bergh
12.35417	1 32 37	+30 54 49		"
14.06604	1 32.0	+30.5		Shao & Schwartz

EDITORIAL

Desk Calculators and Anti-inflation

Esther and Elizabeth in the Departmental office have a new desk calculator, a very neat one about six inches square that performs all ordinary arithmetical office calculations instantaneously - or as nearly so as one could wish. It cost about $70. Nothing very remarkable about that, of course; many students own the pocket-sized, so-called slide-rule calculators which cost from about $25 upward. But what impresses me is how far we have come in the past few decades - even if we leave aside the amazing development of programmed computers.

When the Observatory was opened in 1935 the Department had three desk calculators if I remember correctly. There were two Monroe hand-operated calculators and a German-made electric machine, the Mercedes-Euklid. The Monroes (one still exists - in the storage-telephone room upstairs) were simple, gear-operated, eight-place devices, little more than an adding machine with a shifting arrangement and a crank. To multiply, one keyed in the multiplicand, and then cranked it into the register four times, three times, nine times etc, according to the digits in the multiplier, shifting over one space between each cranking-in. It would take, I suppose, 20 to 30 seconds to multiply two five figure numbers. Dividing was a similar process of successive subtraction of the divisor from the dividend, but a little more difficult in that you had to anticipate when the divisor would no longer "go" and then shift, or else crank until it did "go" once too many times (at which point a great row of nines would come up and a bell would ring) then crank once the other way, then shift. Most of us used the latter technique so that division had a sound pattern quite distinct from multiplication - and appreciably noisier. The Mercedes-Euklid wasn't too much different except that, having a motor, it spared your wrist. It had, however, a nasty habit of jamming, especially in the hands of an inexperienced operator, and this usually required a service call. We younger ones weren't encouraged to use it - in fact I don't recall that anyone used it much.*

Room 205 is the only room in the building with an acoustic ceiling - because it was intended as the computing room; and for a long time was known as such.

A year or two after the opening of the Observatory Dr. Young wanted one of the much-praised Swedish-made Frieden electric desk calculators. However, because it cost about $700 (the price of a small car!), it was out of the question to buy it from the budget, so Dr. Young bought one for himself. He was generous

in letting us use it, and it was quite a thrill to do so. As I recall, it had automatic division - you just set your dividend and divisor, pushed a button and let her rip. Multiplication was, however, only semi-automatic, in that you had to punch in the multiplier one digit at a time waiting for the appropriate number of "roll-overs" and the shift before going on to the next digit. Later there were machines with automatic multiplication,* and that was considered practically the ultimate. We had three Marchant electric models (still have them) the latest of which had cost over $1000. These Marchants were not free of service requirements - in fact we found it desirable to have a service contract for each electric machine, costing about $75 annually.

This is the way things were in the middle 50's when the University got into the electronic computing game with FERUT (named for Ferranti and U. of T.) at a time when one could almost count on the fingers of one hand the number of electronic computers on the continent. FERUT was the brainchild of a few staff members in mathematics and engineering, but we in astronomy played a part too. In the early days of FERUT what was most lacking was something to compute, and a set of "time-difference" navigation tables based on an idea of mine was the first job of any account to be done by FERUT. And Don MacRae was the first person from a department outside of mathematics and physics to learn the art of programming; indeed a course which he gave to our senior students was the first offered here in programming and computer usage for undergraduates.

It wasn't until the mid 60's that electronic desk calculators like the Wang became available at reasonable cost, and not until very recently that they assumed miniature form and, flying in the face of inflation, have been getting cheaper and cheaper.

Try to compare a $75 pocket calculator of today and, say, a $1500 desk calculator of the 1950's. Well, as far as capability, silence, speed and reliability is concerned there is really no comparison. Think then of the cost increase of food, cars, housing and almost anything else over the past 20 years.

Now if only we could eat, drive and live in computers!

J.F.H.

*P.S. My memory about the Mercedes-Euklid failed me badly. Don MacRae produced ours for me (it lives at Observatory House) - in working condition. It is much more sophisticated than I recalled, has both automatic division and multiplication and performs eight-digit operations in about 10 seconds. In fact, for a fifty-year old, it's not a bad machine!

COMINGS AND GOINGS

Don MacRae was in Washington Oct. 31 to Nov. 2 where he chaired a meeting of the Board of Trustees of Universities Space Research Association. He also was Chairman at the meeting of the Associate Committee on Astronomy of the NRC at the same time as the CAS meetings in Winnipeg Nov. 6-9. He was in Houston Nov. 15-16 on USRA and Lunar Science Institute business.

Sidney van den Bergh also attended the Associate Committee and CAS meetings in Winnipeg. Others who attended the CAS meeting were René Racine, Robert Roeder, and Philipp Kronberg.

Sidney van den Bergh gave a colloquium at the Berkeley Astronomy Department on Oct. 30 on "Stellar Populations and Evolution of the Galaxy", and attended the A.S.P. Directors' meeting in San Francisco on Nov. 1-2. From Nov. 9-15 he was observing at Palomar.

Bob Garrison is observing at Las Campanas Nov. 20 to Dec. 9.

Don Fernie was in Hamilton Nov. 7 speaking to the RASC on "Cepheid Variables".

SEMINARS

NOVEMBER

Dr. Henrikson's talk on "Pulsar Magnetospheres" on Tues. Nov. 5 was at the McLennan Lab., not the D.D.O.

Dr. Sandra Faver's talk scheduled for Mon. Nov. 11 was cancelled.

Peter Martin spoke at DDO on Tues. Nov. 12 on "Polarization by Interstellar Grains".

Today (Nov. 26) Dr. A. Labeyrie, Université de Paris is speaking on "Speckle Interferometry" at DDO at 1600.

DECEMBER

Tues. 3rd
DDO 4 p.m.

Kayll Lake "White Holes".

DECEMBER (cont'd)

Tues. 10th — CHRISTMAS COUNTDOWN
DDO 4 p.m.

PAPERS SUBMITTED IN NOVEMBER

S. van den Bergh W. Herbst	A Catalogue of Southern Stars Embedded In Nebulosity
W. Herbst	R-Associations. I. UBV Photometry and MK Spectroscopy of Stars In Southern Reflection Nebulae
J. Heard A. Krautter	The Orbit of the Spectroscopic Binary HD 11291
S. van den Bergh G. Hagen	A Uniform Survey of Southern Clusters

P O T P O U R R I

Comet vdB

Sidney van den Bergh has accomplished the ultimate - discovered a comet! Circular no. 2719 of Nov. 14, 1974 gives three positions of comet van den Bergh on Nov. 12 and 14.

Born

To Philippe and Elaine Teillet a daughter, Lisa Gabrielle, on October 29.

New Arrivals

Karl Kamper a post-doctoral fellow, has arrived to work with Sidney van den Bergh on the motions of supernova remnants. Karl worked in astrometry at Allegheny and Van Vleck Observatories and has volunteered to give a series of talks on that subject on Wednesdays at 4 p.m. in McLennan room 137, starting Nov. 20.

Susan Clark has started to work for Don Fernie as full-time assistant, making photometric reductions and observing.

Alumnus at Science Centre

Claude Faubert, M.Sc. (1972), took up a full-time appointment at the Science Centre Oct. 29, the first such in astronomy.

Talks

René Racine talked on "Local Galactic Structure between Galactic Longitudes 20° and 80°" at York University Nov. 20.

Tom Bolton spoke to the RASC Toronto Centre on "Black Holes and Other Stars that go Bump in the Night" on November 15.

Elected

Philipp Kronberg has been elected to the Academic Affairs Committee at Scarborough College for the current academic year as Physical Science representative.

Queen's Winter Institute

Announcement has been made by Drs. Henriksen and Chau that the second Workshop on Theoretical Astronomy will be held at Queen's Thurs. - Sat., Jan. 9-11, 1975. Prof. Thos. Gold will be visiting speaker on the Friday (probably) on "Pulsars: Observation and Theory". There will be a second invited talk on some Topic in Radio Astronomy. Further information from R.N. Henriksen on request.

Liz's Biz

Elizabeth Barnes, a photographer by avocation, has set up shop in the 15th floor darkroom to take some of the pressure off Warren Magill by doing small printing jobs and making slides. She requests two weeks time scale.

Visiting Lecturer

Dr. Bryan H. Andrew of the Astrophysics Branch of NRC will be spending one day a week in the Department, giving part of the graduate radio astronomy course, commencing Fri. Nov. 22, for about two months.

Leaving for U.K.

Tricia Edwards who has worked as research assistant in the Department since March 1970 (for René Racine and more recently for Ernie Seaquist and Philipp Kronberg) is leaving us on Dec. 20 to go to England for a while. We thank her for her good work and cheerful company and we wish her well.

FINAL ITEM

The Lost Astronomies

Nothing quite so excites outrage in the breast of the professional as to have an outsider butting in uninvited on his speciality. Archaeology is a case in point. Many an astronomer, I suspect, has thought it would be rather fun to have a bash at applying astronomy to some aspects of archaeology: the orientation of pyramids, the alignments of Megalithic ruins, that sort of thing. I've felt the urge myself, standing amid the rather mysterious Zimbabwe Ruins of Central Africa. However, now that the modern astronomer usually knows no more than the barest bones of spherical astronomy, most of us never get beyond the rainy-Saturday-afternoon nothing-on-TV back-of-an-envelope stage of calculations. And just as well, for it appears that archaeologists forever stand zealously on guard, pickaxe in hand, to deal with upstarts of that kind.

Back in the nineteenth century, though, before we all became astrophysicists, it was quite the fashion to at least have a go at the Great Pyramid of Cheops. John Herschel did his bit, as he did towards just about everything, Norman Lockyer became absorbed in Stonehenge, Richard Proctor counted his efforts over the Great Pyramid among his numerous vituperative debates, while for poor old Piazzi Smyth the whole thing got so much out of hand as to become a total obsession that led to his being chucked out of the Royal Society. Archaeologists seem to have viewed all these efforts, mundane or mystical, with uniform disdain. Reactions ranged from mild, if lofty, amusement, to the sort of bellicose fury we ourselves reserve for the UFO buffs and astrologers.

But no one ever learns from history, of course, and in our own times at least a few hardy astronomers have been at it again. The best known of these is probably Gerald Hawkins, who some years ago wrote a book "Stonehenge Decoded", which claimed to show that Stonehenge had originally been laid out as a giant computer for predicting eclipses and the like. The archaeologists had a field day. When they reviewed the book in *Nature* they merely called it "tendentious, arrogant, slipshod, and unconvincing". In their own journal, *Antiquity*, they got in a splendidly trenchant review under the title "Moonshine on Stonehenge", in which the reviewer, having lambasted the "bumbling nature" of Hawkins' archaeology, seized on a particular phrase in the book: "If I can see any alignment, general relationship or use for the various parts of Stonehenge, then these facts were also known to the builders. Such a hypothesis has carried me along over many incredible steps." To which the reviewer gleefully rejoined: "The epithet 'incredible' is a most happy choice."

But to be fair, time has told on the archaeologists (they're prone to that), and it now seems that at least some of Hawkins' conclusions are quite widely accepted. That has only stimulated the fellow into producing another book, "Beyond Stonehenge", which has once again brought down the wrath of the gods. Here, for example, is an excerpt from a recent review:

> *[Previous astronomers] stretched a limited data sample into a grand balloon, puffed it full of speculation, and took off on the lift of [their] own flamboyancy to dizzying heights of archaeological generalization.... In his latest popular account, "Beyond Stonehenge", Hawkins takes to the air again, this time on a largely undocumented, take-my-word-for-it aerial tour of known or suspected prehistoric alignments, beginning and ending with nostalgic stops on the plain of Salisbury. Between, the popular reader gets hasty, sometimes spicy tours of suspected alignments in such places as Yucatan, Peru, Spain, Egypt, and the American Midwest. Where necessary, and as time allows, our balloonist-guide stops long enough to set things right, as at the Great Temple of Amon-Ra, where Lockyer, we are told, confused east and west.... It is a book written for "Chariots of the Gods" and "Secrets of the Great Pyramid" aficionados (though not so well), in a style that will make astronomers wince and archaeologists groan.*

Well, it just goes to show that if you get into this sort of thing, you had better tread softly and carry a big stick. There have been a few, though, that have been better accepted than Hawkins. No, not Fred Hoyle; his work on Stonehenge apparently rates only a pitiful shaking of the archaeological head. No, I am thinking of Alexander Thom.

Alexander Thom is a retired professor of engineering at Oxford, so he doesn't carry the automatic stigma of being an astronomer. It may also help to cram one's papers to the hilt with the most ghastly of trigonometric formulae; there's nothing like having a spare $\sin \Psi$ handy to clobber any dissenting archaeologist over the head with. Be that as it may, he is rather highly regarded.

What Thom has done is to make extremely precise surveys of the alignments in some four hundred of the Megalithic monuments scattered around the British Isles, as well as some in Continental Europe. It is the precision of this work, and the great care with which it was done, that has earned Thom respect. The basic conclusion to emerge from the work is that a considerable number of the monuments were very carefully laid out to contain alignments relating to significant rising and setting points of the moon.

That this was intentional and not fortuitous is now almost beyond argument. Not only are there numbers of such cases, but the alignments are of extraordinary accuracy, often to something like a minute of arc, and in some cases there are as many as eight such alignments in one monument. In addition, they can be used to calculate the value of certain astronomical quantities at the time the monuments were built, and so, since these are varying quantities, derive the date of building. The dates so derived, generally between 2000 B.C. and 1500 B.C., are in good agreement with dates recently derived through radio-carbon dating.

Although Stonehenge is the most famous of these monuments, the most astonishing of them is at Carnac in Brittany. Laid out over many miles, it is centered on Europe's largest known menhir, a 340 ton rock, 67 feet long, that was somehow transported there and aligned very carefully. Ringed around it are a series of megaliths, some 20 feet tall, and up to 10 miles away from the central menhir, that acted as foresights and backsights for the observations of the moon. So accurately are they located, that, considering the rarity with which the moon reaches its extremes precisely at times of rising or setting, Thom estimates that it would have taken centuries of sustained observations to achieve this. For a people that apparently lacked any written language, that is remarkable indeed. Also at Carnac (and one other place in Europe) is a curious fan-shaped array of somewhat smaller stones, accurately spaced with long axes parallel to the rows, which march in twelve solemn columns across three miles of plain. Thom has been able to show that these could have been used as an interpolating device, a kind of three-mile sheet of graph paper in stone.

One of the most interesting, and also controversial, of Thom's claims, is his finding that all of these monuments, from the north of Scotland to Brittany, were dimensioned on an integral unit of distance, which he determines as 2.720 feet and terms the megalithic yard. Again, so accurate is this dimensioning (quite apart from the aligning), that the builders could not have used say ropes for measuring distance, but must have had rods made out of some heavy wood or perhaps whalebone.

What is interesting, of course, is that this similarity among the monuments implies that there must have been a social organization or coherence that was operative over this quite large area of Western Europe. Indeed, the mere existence of such massive monuments, taking so long to build and use, tells us that. This was no collection of small warring tribes, but a well-integrated relatively stable society, capable of sustained and directed effort over several centuries, and having quite astonishing astronomical and engineering knowledge.

There is added interest from a recent revolution in archaeology itself. For a long time, apparently, archaeology held to the so-called diffusionist theory, which claimed that European culture was derived from Middle East cultures, particularly the Mycenaean. The latter was supposed to have slowly spread across Europe from the southeast. But now radio-carbon dating (which, incidentally, has had its tough times with the archaeologists) has shown that most of the megalithic ruins of Western Europe actually pre-date their Mediterranean counterparts, and thus were independent of them.

We have virtually no clues as to who these people were, what their social structure was, why they were so fascinated by the moon, why they built monuments on a scale that must have strained their resources to the utmost, how long they existed, or what became of them. What we do know is that they had a remarkable knowledge of at least lunar astronomy, in particular certain anomalies in the moon's motion, that vanished with them and was not re-discovered until the time of Tycho Brahe, more than three thousand years later.

J.D.F.