

Somebody with an interest in the development of the calendar should consider the entries about different calendars in Appendix 2.1.

For the naked eye observer information about asterisms is given, for example: The **Diamond of Virgo** in Virgo, Leo, Boötes and Canes Venatici; the **Lozenge** in Draco; the **Summer Triangle** in Lyra, Aquila and Cygnus; and the **Teapot** in Sagittarius.

For an observer of meteor showers the dictionary gives among others, information on the **Orionids**, the **Quadrantids** and the **Taurid-Arietids**. And for the comet seeker some comets with a South-African connection are **Bennett's comet** and the **Johannesburg comet** of 1910, also known as the **Great January comet** or **Miner's comet**.

Finally there is also some information for those with an interest in linguistic oddities. Two examples are: (a) The stars α and β **Delphini**, were named **Sualocin** and **Rotanev** after the Italian astronomer Niccolo Cacciadore's latinized name Nicolaus Venator (spelled backwards). (b) The English 'globule' is translated by the Afrikaans synonyms 'bolletjie' and 'globule'. In the compilation of the dictionary the general rule was always to list all synonyms in the case of compound words. Therefore the translation for **Bok's globules** should have been **Bok se globules** as well as 'Bok se bolletjies'. However, it was wisely decided rather to leave out the last possibility!

To summarize: It is clear that much work has still to be done to get more people interested in astronomy – at least to a level of an average general knowledge. Let us not forget that the responsibilities of both professional and amateur astronomers also include getting the public, and especially our young people, interested in astronomy. However, it shouldn't be an interest flaring up and fading down like a nova. It should be an interest that lasts for at least the sidereal period of Jupiter, or better still, Saturn or Uranus! Else, we shall finally find ourselves to be like a colony of astronomers on a far-off desolate planet in a large galaxy.

DEPT OF MATHEMATICS & APPLIED MATHEMATICS, POTCHEFSTROOM UNIVERSITY FOR CHE, POTCHEFSTROOM, 2520

ASTRONOMY, THE SCIENCE MOVEMENT AND POLITICS IN THE FUTURE OF SOUTH AFRICA.

Keith Gottschalk

SUMMARY

Astronomy faces an increasingly competitive environment for research funding. Success requires the astronomical family of sciences to institutionalize lobbying for the profession's interests.

Additionally, organizing a public constituency of supporters will best defend and advance astronomy's future. Astronomy's strongest political credibility with future governments clearly lies in demonstrating its usefulness for, and commitment to, science education in schools.

1. Introduction

South African astronomers working on the Hertzsprung-Russell curve will notice that our politics are slowly evolving from a degenerate white dwarf into a red giant. This paper, *Astronomy, the Science Movement and Politics in the Future South Africa*, deploys the following working definitions:

- Astronomy is the way astronomers satisfy their curiosity at the expense of the taxpayer; (adapted from Artsimovich cited in Sagdeev: 1988) and

- Politics is who gets what, when and how. (Lasswell: 1958).

Warner (1979: xi) and Spargo (1992) remind us that the Cape Colony's first astronomers played a leading role in politics, and in educational reform. This paper argues that the future of astronomy in a transforming South Africa depends on the astronomical profession again making its voice heard in the public arena.

Even the most innumerate political scientist has learnt the hard way that the budget and forex for research, library purchase of books and journal subscriptions, salaries and posts has disappeared down a wormhole.

The budget squeeze on the astronomical family of sciences is such that South Africa's current largest telescope is a pre-World War Two hand-me-down from Oxford. Indeed, the Government allocates the entire FRD a budget one-third of the annual electricity bill of its pet uranium enrichment plant at Valindaba. (ANC ISTG: 1992:8). There is no sign that this crisis in research funding will improve in the foreseeable future.

It is necessary for the profession, and amateurs and supporters in ASSA, to organize ourselves into a high-profile pressure group for US-style lobbying, but orientated towards South Africa's political realities.

2. The Science Movement

The National and Democratic Parties have front-benchers who understudy science policy. Two further arenas are also relevant to Astronomy. First, the attitude of politically active education and teachers' movements, such as the South African Democratic Teachers Union, SADTU, towards the importance of science education in future syllabi. Second, the weight Astronomy and Astrophysics carry vis-a-vis other sciences within the S2A3 and similar organizations.

The part of politics most relevant to Astronomy is what can be termed the science movement. Academic researchers who are also ANC members founded groups such as Science for Democracy. In 1990 they inaugurated the ANC Interim Science & Technology Group, (ISTG) now placed under the ANC's shadow Department of Economic Planning. In addition, the ANC has an Information Systems & Information Technology Group run by full-time officials.

The ISTG has formed six standing workshops to draft policy recommendations for our most probable future government:

1. Energy
2. Environment
3. New Technology
4. Research and Development
5. Rural technology
6. Technical Education and Training

Any future Government's policy, and allocation of scarce resources, towards R&D, and Science and Technical Education, will largely determine the scope of our next telescope.

The ANC ISTG's latest draft policy guidelines (March 1992) supports increased national investment in areas ranging from chemical vapour deposition to biotechnology - but there is no mention of Astronomy. Its R&D section notes that the percentile of South Africa's GDP spent on academic research, 0,32%, is proportionately similar to Japan (0,23%), USA (0,34%), Australia (0,35%) and France (0,45%). However, it criticises the 0,56% of our GDP spent by the private sector on R&D as between proportionately one-third to one-fifth the private sector R&D budget in these other countries.

The implications of this policy analysis are not optimal for increased funding for academic research, and astronomy is the most literal "blue sky" research.

The guidelines recommend far more effort to develop technology for cheap rural telecommunications; new materials science; mineral technology; information technology, especially software; and sensor technology. Only the last two could conceivably become relevant to Astronomy.

The ANC ISTG latest draft policy does however cite the Project Apollo space programme as an example of how technologies developed for space gave impetus to the US electronics and computer industry. (1992:7).

3. Strategies of Astronomy & Space Lobbies in other countries

Overseas, the Astronomy and Space lobbies do not passively lament that Astronomy lacks the mass following of sport, pop concerts and most humiliating of all, astrology. They work hard to give Astronomy the flamboyant high-profile of soap operas, complete with its own pop stars, for example Carl Sagan with his outstanding Cosmos TV series. Today, the BBC and US PBS broadcast similar TV and home video series on astronomical personalities and their contributions.

Astronomy and spaceflight fans show skill in using the media to popularize Astronomy. Ressimyer obtained heavy subsidies from photography companies to widen the marketability of his coffee-table book *Space Places*, (1990), which glamorizes some of the world's most famous optical and radio observatories.

The United States' NASA runs its own Art Program. NASA commissioned or bought 800 paintings from 200 artists for its own space art collection. (Schulman: 1990: 81-82) Russia's Union of Artists has a Committee on Science and the Cosmos, whose painters get trips to rocket factories, training centres and cosmodromes, and residential fellowships at Houses of Creativity. Their paintings enjoy wide-

spread exhibitions and purchase by public institutions. (Myagkov: 1990: 54, 56).

Schulman and Myagkov claim with a straight face that this state patronage of fine art is solely to record the spirituality of space exploration. A political scientist would find this no more credible than if governments claimed their subsidies for enriched uranium was due to their enjoyment of the symmetry of the Periodic Table of Elements.

Obviously, these parastatals seek and use vivid imagery as advertising, to win popularity and public empathy for their agenda. They invest effort and resources to win taxpayer and treasury acquiescence before the annual fight over their budget applications.

Beyond parastatals and institutions, a whole US public constituency has organized itself into the Space Movement. A variety of pro-space societies organize their members into letter-writing and telegram-sending panels whenever a scientific space probe is threatened with a budget cutoff. In addition, they organize their supporters into "phone trees" - each member phones four other members, so protesting phone calls to Congress & senate representatives pour in. (Bell: 1985; Forbes: 1988).

Astronomy institutes in the USA organize workshops to plan in detail how Astronomy can revitalize school science teaching. They make a point of publicizing black and women astronomers as role models for ghetto youth. (Brown: 1990).

South African astronomers and astronomy fans read in just one recent issue of *Sky & Telescope* (March 1992):

First, the editor mourns that USA has "only 250 000 aficionados" of astronomy: (1992: 245)

Second, Japan's annual star party at Tanai attracts 4 000 persons to a carnival atmosphere, where families camp and picnic outdoors with pop concerts, fireworks, telescope displays, for three days. Every variety of souvenir is on sale. (1992: 267-8)

Third, we are urged to visit an Egyptian historic monument for its astronomical-calendric significance - and the fun. (1992: 276)

Fourth, an ad urges us to tune in to the TV series *Star Hustler* by Jack Horkheimer on the fun of naked eye astronomy. (1992: 308)

Fifth, high school students receive awards for astronomy research projects. (1992: 333)

Sixth, an ad urges us to holiday with Cape Town's astronomers to enjoy the 1992 eclipse.

4. *Planning a future for South African Astronomy: Some proposals*

"the sheer wonder and profundity of science is usually what draws its ablest practitioners to their chosen field. Nevertheless, for the foreseeable future, the health of S&T in South Africa will depend on how effectively its connection with bread and butter concerns is initially stated and ultimately proven."

- ANC ISTG: Draft Policy Guidelines 1992, p.6.

4.1 *Strategy*

4.1.1 Astronomy should establish a strategy committee drawn from professional astronomers, ASSA, and possibly a FRD representative.

The committee ought to draft a five-year plan and ten-year goals for priorities in South African astronomy. Success in lobbying for a

3m telescope will certainly require a telescope action committee to campaign and fund-raise for five or ten years. Such plans should be reviewed and updated annually, to match altering trends in research and new equipment.

4.1.2 This strategy committee, coopting people as necessary, should annually approach the science and education policy representatives of all political parties, to state the case for financial and other support for Astronomy.

4.1.3 ASSA, or possibly a wider coalition discussed below, needs to organise as a public constituency of friends of astronomy. Public supporters can most credibly write and phone the FRD, and Treasury Department heads in addition to political decision-makers, to lobby for funding and other urgent astronomical issues.

For example, this public campaign could start by backing the SAAO Sutherland's requests for the main Cape Town-Johannesburg air route to be shifted northwards from over Sutherland's telescopes. In saturated air, the jets precipitate contrails which drift over telescopes' line of sight for up to twenty minutes of pre-booked observation time.

More than getting the air traffic radio beacon shifted is at stake. The name of the game is to make the state bureaucracy aware that Astronomy has a significant and noisy constituency of public support, who will assert Astronomy's interests. This will deter the state from future actions, or inactions, detrimental to the Astronomy profession.

Similarly, we can help a 3m telescope action committee publicize that the taxpayers' money wasted on Mosgas equals the current government subsidy to the entire University of Cape Town for 120 years. More noise from astronomy's supporters may help deter similar state mismanagement of scarce financial resources.

4.1.4 State funding for Astronomy will always be less than necessary. Here the left science movement has argued that only the wealthy can afford the resources for "centres of excellence". Scientists in developing countries will have to increasingly build up "networks of excellence", pooling scarce resources at different institutions in cooperative research. (ANC ISTG: 1991: 18).

Already, the SAAO at Sutherland numbers amongst its international cooperation seismographs and automatic solar monitoring telescopes. Nather and Winget's (1992) "whole earth telescope" should encourage SAAO to seek overseas partners to jointly fund telescopes, and for as many as possible other projects. The academic boycott is now history.

4.1.5 South African astronomy must change its public face. Every ASSA centre must take the initiative in approaching girls' schools and black schools (including African, Asian and Coloured) to invite them to public talks and shows. Every ASSA centre must encourage women and black students to enrol as junior or full members for ASSA.

ASSA must achieve significant enrolment of black and women members within a five-year plan for astronomy.

4.2 Education

Obviously, we are not only astronomers but also citizens. The most urgent demands on state spending will for the foreseeable future be on essential needs - clean water, sewage, electricity, and social security.

Astronomy's strongest strategy for credibility with political decision-makers is undoubtedly the role it could play in science education.

Every scientific conference called by the City Planner, IDASA, Science for Democracy, and last year's Annual Review of Astronomy and Astrophysics, hears the same statistics of our "human resources catastrophe". (ANC ISTG: 1991: 16) Spargo and Milne have repeatedly spoken on this theme. Out of every 100 Africans starting Sub A, only one achieves matriculation exemption. Out of every one hundred Africans with matriculation exemption, one one has a university pass in mathematics. The ANC ISTG draft policy recommends major improvements in science teaching in schools and teachers' colleges. (1992:22-23).

4.2.1 Around the world, education systems of every ideology from the USA (Mumford: 1992) to the deceased German Democratic Republic (Bardien: 1990; Gebhardt: 1991) encourage Astronomy as an entire subject in the high school syllabus.

One Zimbabwe school, and quite a few schools in Germany and other countries, have their own observatory. Astronomy is not itself a major job provider. But Astronomy is universally regarded as the most vivid awakener of interest in science and engineering careers generally.

The only way to end the insult that school geography books limit Astronomy to a few pages on tides and eclipses is for astronomers to demand to serve on the syllabus drafting committees for Physics, General Science and Geography. Astronomers need to write chapters and books on at least the "new" solar system and what it tells us about earth's own geology and atmosphere.

4.2.2 South African astronomers need to write both popular pamphlets and school texts which prominently feature black and women astronomers such as Caroline Herschel, and the USA's Benjamin Peery and Carolyn Schoemaker. South Africa's Fred Marang should be featured in print and video interviews for school science brochures.

4.2.3 The other most frequently-cited educational atrocity compares South Africa's ratio of university-graduated engineers: technician-trained mechanics at 4:1 to the 1:5 ratio in Pacific Rim countries such as Japan, Korea, Taiwan and Singapore. (Milne: 1992).

Surely mirror-grinding and telescope-making projects are ideal for the curricula of not only technikons, but also technical colleges and technical high schools?

Surely learning to make a simple radio-telescope is ideal for electronics curricula in technical schools, colleges and technikons? We can stress the excitement that telescope making can infuse in not only academic, but especially technical-stream education.

ASSA must network with the domestic electronics industry to state the case for scholarships and donations. We must show how building and operating radio telescopes will attract apprentices to electronics. We must show that learning to use software for manipulating astronomical images and spaceflight simulation teach computer literacy will attract to computer career.

4.2.4 Planetariums need to monitor the demographic coverage by gender and colour of their outreach programmes that bus in school pupils. Planetarium staff will need to take the initiative in contacting principals, science and geography teachers at African schools in particular, and encourage them to bus in both staff and school students.

Spargo's findings (Bramwell & Flanagan: 1991) on the authoritarian and academically weak African teachers training colleges cue us that geography, maths and science teachers trained there might feel inadequate and threatened by high-powered programmes, and unable to answer ensuing pupils' questions.

We need to be sensitive to such defensiveness, and initiate planetarium programmes aimed at showing such teachers how Astronomy can facilitate teaching and excite pupils in general science, geography, maths and physics lessons.

Astronomy's organized involvement here could be the key to gaining respect from present and future governments, and having our funding needs taken seriously.

4.2.6 The Astronomy strategy committee must make a point of regular contact with trade union leaders, to explain how science education can help retrenched workers be retrained for new, and better-paying jobs. We can support trade unions in their negotiations to ensure that retrenchment packages include corporate, charitable and state funding for such technical retraining.

4.3 Coalition-Building

The winning strategy for Astronomy is to make friends and influence people on a wider scale than before. It will require full-time PR representatives, with a budget, to do politically what we do professionally; establishing networks, making allies, and convening the broadest possible coalition of interests.

4.3.1 For maximum success Astronomy needs the maximum allies. In the USA the concept of the space community embraces not only astronauts, but space scientists, manufacturers, merchandisers and consumers of space products and services. Just the beginnings of a local list would include:

INSTITUTIONS:

Observatories,
 University departments (e.g. Satellite, Rocket and
 Electronics engineering, Geographical Information Systems, etc)
 FRD
 Weather Bureau
 Department of Environment
 Department of Forestry
 Planetariums
 Education department syllabus committees
 Textbook writing panels
 Municipal planning departments

COMPANIES:

Telkom
 SATV, BOP TV, M-Net
 Dish antennae companies
 Silicon Pages companies (Electronics and computers)
 Telescope & Binocular wholesalers & retailers

PEOPLE:

Professional and amateur astronomers
 Physics, maths, geography and general science teachers at high schools, teachers' training colleges & technikons

Journalists - press, magazines, radio & TV
 Sci-fi fans
 Scouts & girl guides, youth movements
 Radio hams and amateurs

ASSA needs to organize a Friends of Astronomy & Space. A local Astronomy and Space lobby is optimum for certain lobbying purposes. The broader a public constituency grows, the more weight it packs as and with voters and taxpayers.

4.3.2 Today, to take one local example, the Cape Centre & SAAO is open to the public only two evenings per month. The Cape Centre has one painting of Sutherland observatory. The SAAO Observatory museum has historic memorabilia, and globes of Mars and the Moon.

This public relations and public science education depends on volunteers at SAAO. At HarTRAO, professional radio astronomers' give up their spare time for educating school pupils and teachers alike. (Bramwell: 1992) There is no or little outreach funding to bus in African adult members of the public. These are taxpayers and voters whose support Astronomy will increasingly need.

4.3.3 At the moment, Astronomy's popularization rests upon all too few, and underfunded, planetariums. The skill Tony Fairall and all his staff members put into 15 Million BC and other planetarium shows is unknown to virtually any African schools or even African science and geography teachers. This needs affirmative action. The public face of Astronomy needs to remedy this as from 1992, not next year.

4.3.4 For academic researchers, advertising is removal of time for research and publication, already diminished by teaching, marking and administration. But unfortunately, fund-raising will be for the foreseeable future an increasing necessity for our profession. Sooner or later, Astronomy needs to professionalize these efforts far beyond a few planetarium staff, and Astronomy academics teaching at UCI's summer school.

4.3.5 Prominent in the first five year plan for South African astronomy must be remedying this situation. Every observatory should fund-raise for a budget for a visitor centre, with at least one permanent guide. The daily schedule should offer a mix of tours to cater for both tourists & school children. Our tactic should be to sell Astronomy to science educators in the various education movements. We should popularize Astronomy and space as the ultimate spectator sport. Eclipse tours can also be organized by South Africans.

It is clear that SAAO observatory can use its regency, victorian and edwardian heritage of scientific instruments to become the major astronomical tourist and educational centre in South Africa. It should encourage the links with the Victoria & Alfred Waterfront developers beyond restoration of the time-ball.

4.3.6 It would not cost the earth for astronomical institutions - observatories, planetarium, university departments - to invite painters and graphic artists from the Fine Arts departments of universities and technikons, painters and sculptors in private practice, and school art classes, for annual tours. Invite them to explore the romance of the sky overnight at both our amateur and professional observatories. Later, this project will need to seek corporate sponsors to both buy and commission the best of subsequent art works.

These would go on travelling exhibitions, alongside video or other shows. So could museum meteorites - and the diorama backgrounds of the catastrophe kind so beloved of Sky & Telescope and the Planetary Report, in coverage of the Arizona, Tunguska and Yucatan meteors and comet impacts. Equipment has excited many young minds towards a subsequent career in science. Consider the exhibition potential of numerous paraphernalia from parabolic dish antennae, Victorian brass instruments, even fibreglass replicas of the noon gun and time balls.

These should tour schools, ghetto community centres, shopping malls, and art galleries in addition to other museums. Is it possible for such an exhibition to go on display in the Parliamentary club Fernwood, and the Parliamentary library? Remember where the FRD budget comes from.

If we do not invite education, political and trade union leaders to such briefings and displays, we by default leave Astronomy vulnerable to future derisive dismissal as "elitist" and "irrelevant".

4.3.6 How can the popularization activities reported in the Sky & Telescope issue referred to above be adopted in South Africa?

First, instead of a financial drain, there is the potential of fund-raising for ASSA and SAAO to organize South African "star parties". ASSA centres, MNASSA and these symposia already provide highbrow activity. "Star parties" are concerned with popularizing Astronomy. Like the Japanese ones, these should also include pop concerts, firework displays and telescope viewing.

The organizing committee should choose some sites giving mass access to at least Jo'burgers, Capetonians, Durbanites and Port Elizabeth and East Londoners. Such star parties should be highlights at the Cape Town and Grahamstown Festivals. Telescopes, binoculars, books and refreshments stalls are just the most obvious commercial stalls, paying a small fee, for the first South African star parties. Girl Guides, Boy scouts, a variety of youth movements and schools are a key target audience.

4.3.7 Second, possibly attached to all planetariums, we should build up resource centres acquiring every film or video, from Cosmos to Star Hustler, for circulation to schools, youth and other organizations. It is necessary to fund-raise so that where required a projectionist, with audio-visual equipment and a generator, can ensure such resources are available as widely as possible.

4.3.8 Third, why is it only overseas tour operators who can offer such exciting vacation packages as meeting Cape Town's amateur and professional astronomers? What star camp package can combine pick-nicking at MacClear's historic beacons, braais, tours of observatories and telescope viewing?

4.3.9 Fourth, all these activities, and competitions for the best school astronomy essays and projects should prioritize the majority of our nation - women and blacks. This is the groundwork for ensuring that the astronomers graduating ten and twenty years from now are not virtually limited to one gender and one colour.

This is vital for two reasons. One, we cannot afford not to tap the the talent of all brains in our country for Astronomy. Two, think politically of the credibility of Astronomy, before it is hurt by dismissive jibes of "elitist" or "first world irrelevancy".

4.3.10 Beyond learning from Japan, South African astronomy will require other activities.

We should invite science shadow ministers and study groups of all parties, Parliamentary and extra-parliamentary, to annual presentation of current work, including visuals of the laypersons type.

4.3.11 Can a local science writer get photography firms to commission coffee-table books on South Africa's own observatories and astronomers, from Herschel to Hartebeesthoek? The text should range from Steven Watson's rendition of San (Bushmen) myths of the moon to the current debate over the big bang.

Some of these proposals are practical; others are more medium-term. I challenge all of us to see how many of them we can implement. Our motto and bumper sticker: Astronomy is looking up.

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*Political Studies Department
University of the Western Cape.*