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EDITORIAL STUFF:

With this issue, we're back on a monthly basis, so the dues/subscription rate returns to \$2 per issue, payable to me. You still get one issue for every two pages of material you submit; where I've shrunk pages to save space, I've compromised between the number of submitted pages and the number of printed pages to determine how many extra issues you get. **SEND IN MATERIAL.**

Robert Dick: you asked what I'll do when my daughter Isabella is old enough to read material I've written. I don't know. L.A. is full of lousy parents who annoy me because they exercise no control. I've been reading lots of books about being the parent of a baby, but haven't read much yet about dealing with kids age two and older.

Chris Langan: your passage about Metaboogers was on target and the funniest and most clever bit of satire I've ever seen in *Noesis*.

ANSWERS TO PETE POMFRIT'S ANALOGIES (NOESIS 108)

ANSWERS

TEST 1 1. Rorschach 2. Succubus 3. Libel 4. Oranian 5. Hannel
6. Genara 7. Virginium 8. Didach 9. Cetyl 10. Aliques 11. Capulet
12. Armarian 13. Yod(Hebrew alphabet) 14. Kahatriya 15. Chalder
16. Carucate 17. Gerah 18. Pycnostyle 19. Pirkin 20. Balthasar
21. Talent 22. Pointe 23. League(rugby) 24. Petaeus 25. Childernae
26. Pierce 27. Groschen 28. Sandhi 29. Acoth 30. Amalthaea
31. Waraf 32. Clerihew 33. Kalyptza 34. Rup 35. Sone 36. Aristippus
37. Corroboree 38. Daleth 39. Orthoclose(Mohs scale) 40. Scruple
41. Semis 42. Epitricit 43. Propriopomenon 44. Stannic 45. Pennioner
46. Othrus 47. Varanaai, formerly Benates 48. Amrita 49. Homogeny
50. Choreplacopal

TEST 2 1. Renifleur 2. Shadwell(Foet Laureates) 3. Stephen(Saints)
4. Berry 5. Bishamon(Japanese Gods, Goddesses) 6. Colin Faepou
7. Pratioma 8. Epilogue 9. Herrick 10. Aposterioristic 11. Ireland
12. Lassa 13. Combololo 14. Embracery 15. Ultimo 16. Bekah
17. Housenon 18. Dghaisa 19. Thyrsus 20. Parousia 21. Ontogenesis
22. Ahriaman 23. Devanagari 24. Synteresis 25. Somatonic
26. Synalepha 27. Eustyle 28. Gallop 29. Ptolemy 30. Noisun
31. Ichor 32. Cenacle 33. Orthotonesia 34. Cacophony 35. Corrasion
36. Sublimation 37. Kanadu 38. Kelys(Welsh) 39. George(sadul)
40. Gostas 41. Berataria 42. Chukwa 43. Mullet 44. Gilbert 45. Coomb
46. Diano- 47. Mantissa(logarithms) 48. Cryptogam 49. Steradian
50. Eleeosynary

TEST 3 1. Onocentaur 2. Altricial 3. Opinicus 4. Hovial 5. Chanticleer
6. Nephthimier 7. Staal(golf-putts) 8. Rossetti 9. James 10. Engrailed
11. Souuse 12. Webb 13. Solander 14. Propagatory 15. Glubbudubdrir
16. Spear 17. Panoistic 18. Oranger(real name James Stewart)
19. Olitory 20. Firlot 21. Pyxis 22. Columbius 23. Epitrochoid
24. Heterosician 25. Kheda 26. Oxyael 27. Laburnum(Golden-chain)
28. Pustanella 29. Responsions 30. Zenana 31. Epistile 32. Hoinia
33. Acceleration(rate of change) 34. Hanuman 35. Coule 36. Hydrid
37. Caserlung 38. Centesimal(anagram) 39. Bon 40. Meconic
41. Frigidarium 42. Bitter(tastes) 43. Dhole 44. Yakusa 45. Arondight
46. Gluck 47. Tinctorial 48. Uropygal 49. Sucurujh 50. Sheval

TEST 4 1. Paasche 2. Protection 3. Phaedra(complex) 4. Marrayt
5. Lemuel 6. Cynagetic 7. Prosymite 8. Berceuse 9. K'Nchel
10. Bay Street 11. Austringer 12. Redbreasts 13. Vermeer 14. Bulse
15. Bort 16. Okimono 17. Gausea 18. Hypasthral 19. Illinium
20. Uereta 21. Terrella 22; Belgium 23. Gnoanon 24. Lituus
25. Dithyrahah 26. Wurlley 27. Paragomic 28. Aphaeresis 29. Hypocycloid
30. Trammel 31. Yamaite 32. Focket(Cockney rhyming slang)
33. Hieronymian 34. Jekyll 35. Combre 36. Botel 37. Lacrosse
38. Hange(Harou Pello) 39. Robert(Browning) 40. Tushaugh 41. Attilla
42. Cosine 43. Paacocks(gulled charlots) 44. Sheel 45. Cohort
46. Jung 47. Kasygin 48. Kitchener 49. Magellan 50. Vini(goth)

TEST 5 1. Landsteiner 2. Otrouchtas 3. Cordoba 4. Agnus Dei
5. Kipling 6. Vonted 7. Majlis 8. Vector 9. Linc 10. Passe
11. Penumba 12. Aesthate 13. Ambrosia 14. Bolster 15. Bigg
16. Missal 17. Cabral 18. Sephardim 19. Valmski 20. Kizal(Pharisees
in Faland) 21. Lead 22. Codicil 23. Pousain 24. Malliere 25. Tercel
26. Garuda 27. Gyp 28. Isotonic 29. Consubatantiation 30. Chianae
31. Parataxia 32. Zucchini 33. Kubens 34. Haraclitua 35. Poe
36. Pionatua 37. Portmantaua 38. Easumar 39. Prokaryon 40. Loti
41. Hijnsky 42. Uadain 43. Henry(Hoore) 44. Hahn(Nobel Prize)
45. Alkaid(astrology) 46. Telstar 47. Siemens 48. ETA(Spain)
49. Reeto 50. Garda

TEST 6 1. James(William) 2. Silicon carbide(Mohs revised scale)
3. Collop 4. Coccygeal(vertebrae in spine) 5. Marshall(New Zealand
PM's in order) 6. Hargreaves 7. Nadir 8. Athens 9. Bus 10. Acrocarpeus
11. Sophomore 12. Swinburne 13. Neerland 14. Oflag 15. Sacheverell
(Sitwell) 16. Peela 17. Sekhet 18. Titanium 19. Vorticism 20. Kekulé
21. Hindenburg 22. Turner(Canadian PM's in order) 23. Cups(Tarot)
24. Veronese 25. Washing-poda 26. Sterns 27. Scots(Sir Walter
28. Blucher(Stavanson) 29. Trotsky 30. Committee(Aedic) 31. Kojiki
(Shinto) 32. Hansard 33. Pir-Man-Og 34. Of Braganza(Catherine)
35. St. Teresa 36. Lübeck 37. Agio 38. Le Manche 39. Faisha
40. Haeckel 41. Descartes 42. Kaccha(Sikhism) 43. Suit(Cockney)
44. Jupiter 45. Shevuoth 46. Surah 47. Hotei(Japanese Gods)
48. Karaoke 49. Vulcan 50. Adelaide

TEST 7 1. Deucalion 2. Stale(mate) 3. Abducent 4. Prothesis
5. Australia 6. Archinandrite 7. Sadhu 8. Finucula 9. Ziggurat
10. Blackmore 11. Lough 12. Brahas 15. Cherubin 14. Oroviviparous
15. Jack(pantoon) 16. Manoe(capital) 17. Hississippi Subble
18. Fronubus 19. Engineer('s chain) 20. Nethuselah 21. Britten
22. Bull 23. Epstein 24. Secant 25. Laurasia 26. Librium
27. Harigraph 28. Rinaldo(sword) 29. Cloisinas 30. Cobbett
31. Aldrin(Hoon) 32. Pluto 33. Anecd 34. Ithra 35. Contango
36. Anhorbite 37. Balthasar(Magi) 38. Virgil 39. Barnum(showman)
40. Bowie 41. Bohr 42. Diarael 43. My Fair Lady 44. Tosout
45. Bullock 46. Neptunist 47. Fahrenheit(451, books by Bradbury)
48. Albattross(golf) 49. Judogi 50. Kesusau

TEST 8 1. Travelator 2. Scillost 3. Terraqueous 4. Siegfried
5. Heeliga(Ganges) 6. Bossey 7. Jesse Tree 8. Darnier Cri
9. Protium 10. Hisanry 11. Genuadheit 12. Otnit(visibility)
13. G 14. Annulet 15. Notation 16. Hodred(Knights) 17. Rochelle(salts)
18. Lutyens 19. Bushido 20. Kennedy(assassinated) 21. Realter
22. Ultramontane(Alps) 23. Fizi 24. Agua Regia 25. Rood 26. Rangig
(Sonar) 27. Acham 28. Twin Shen Gatti 29. Bus 30. Bracket 31. Quakers
32. Janet 33. Resader 34. Lawrence(David) 35. Friday('s child)
36. E 37. Vaucluis 38. Nolition 39. Shabsadah 40. Alabamine
41. Salinity 42. Shibuichi 43. Squid 44. Ashoclan 45. Tekonyer
46. Jatts 47. Antrogation 48. Mexico 49. Possession 50. Jove

TEST 9 1. Vapulation 2. Mesial 3. Jataka 4. Cactotopia 5. Gaidhealtachd
 6. Hobia((red)breast) 7. Ptarmigan((white)grouse) 8. Gressorial
 9. Whittles 10. Viscerogenic 11. Adharma 12. Vitellia 13. Kalkhor
 14. Realpolitik 15. Arco 16. Merkin 17. -Sommeier 18. Braavivleis
 19. Antonine(wall) 20. 37(Film title) 21. Paethers((pulled)chariots)
 22. Marianne((Duchess)) 23. Dea- 24. Auchlet 25. Tiphys 26. Fouesses
 27. Tekestich 28. Pecksaiffism 29. Pythymetic 30. Broomball
 31. Py Shadax 32. Anaptyris 33. Khural 34. The Fortune
 35. LagerGr(Hobel prize) 36. Argand(burners) 37. Consequent(ratio)
 38. Basmaist 39. Peck 40. WAC 41. Franklin(Roosevelt) 42. Colette
 43. Screaming Eagles(US regiments) 44. Tycho Brahe((noses)) 45. Ayla
 (Pillars of Hercules) 46. Fehner 47. Agnes Wickfield((apt anagram))
 48. Sheeh((beeh)) 49. Yarbles((nicknames of people in Victoria, Australia))
 50. Acrolith

TEST 10 1. Mummular 2. Klith 3. Glauber((salts)) 4. Frossade
 5. Mercaptan 6. Black(snooker balls) 7. The Isaurian 8. Bogata
 9. Jhergo 10. Lick((spittle)) 11. Curettage 12. Kirpan 13. Watson
 14. Panama((canal)) 15. Haraldsson 16. 1939(elements) 17. Afferent
 18. Antithesis 19. Corday((killed by)) 20. Sable((heraldry)) 21. Luna
 22. Lisbon 23. Pavia 24. Eymograph 25. Sting((bibles)) 26. Portoullis
 (4 English Pursuivants) 27. Vit 28. Debt 29. Encke 30. Interpleader
 31. Bloody 32. Parvanimity 33. Bayeux Tapestry 34. Willow 35. li
 36. Tuxedo 37. Beverley(The Rivals, Sheridan) 38. Nan-Shan
 39. Dawkins 40. Bagheera 41. Anacardic 42. Ciscentric 43. Attek
 44. Mahayana 45. Tine 46. Blitkrieg 47. Disonus 48. Province
 49. Cavaloade 50. Plantigrade

TEST 11 1. Phaeophyceae 2. Header 3. Baby(wine bottles) 4. Ape((books
 by O'Neill)) 5. Turmeric(with alkali) 6. Nitro 7. Decani 8. Adelaide
 9. Chichevache 10. Stenothorous 11. Isanai(Shinto) 12. Sciamaehy
 13. Quarrrel 14. Pythias 15. Macron 16. Verbata 17. Adalee
 18. Bizarra((complex)) 19. Cathode 20. Monohelitte 21. Hiehe
 22. Teare((other names for vervain)) 23. Tachebrusa 24. Arzeneia 25. Donesi
 26. Soroban 27. Brigidodoro((horas)) 28. Precept 29. Kangaroo(rugby)
 30. Triphibious 31. Big Crunch 32. St. Vitus 33. Phis 34. Uurus
 35. Waygoose 36. Theory 37. Niati 38. Gradus 39. Seoulio 40. Punte
 41. Horatio Nelson((apt anagram)) 42. Lieberkuhn 43. Gallifrey
 44. Solheim(Cup) 45. Tennyson 46. Seiche 47. Narcissus
 48. Argyraepides 49. Curse of Scotland 50. Boliol((nicknames of))

TEST 12 1. Slug 2. Unau 3. Faroph 4. Shikni 5. Learning 6. Anaseiss
 7. Aneta 8. St. Gertrude((patron saints)) 9. Haisum 10. Oceana 11. Hesp
 12. Cyanophyceae 13. Preantepnultimate 14. Lady Edith Plantagenet
 15. Verdigris((29, copper)) 16. Necrographer 17. Paracrostig 18. Dirac
 19. Stars((plays by O'Casey)) 20. Foucault 21. Victor 22. Eouris
 23. Etepinoletic 24. Poikilothermic 25. Jones(Inigo) 26. Stegophilist
 27. Zom Zom 28. Idomeucus 29. Nodylsist 30. Honokini 31. Sabin
 32. UNICEF 33. Doryphorus((by Polyglottus)) 34. Dampton(Christian lectures)
 35. Viminal((7 Hills of Rome)) 36. Hygrometer 37. Declivity 38. Azolati
 39. Fanto- 40. St. Cecilia 41. Howard((wives of Henry the 8th))
 42. Haddal(play, golf) 43. Valley(quote by Brian Johnston, cricket
 commentator) 44. Hill((Madameista)) 45. Stadler((Craig, golf))
 46. Catastasis 47. Lucas 48. Thiol 49. Lies(Cockney) 50. Walker(Cup, golf)

TEST 13 1. Stonewall 2. Inca 3. Diganbaras 4. Plasma 5. Gustavus
 Adolphus 6. Bellus 7. Delanira 8. Indulgence 9. Brythonic
 10. Gynnosperm 11. Local((anaesthesia)) 12. Intaglio 13. Barcarole
 14. Arabian 15. Borg((consecutive wins at Wimbledon)) 16. Oracle
 17. Serus(Greek) 18. Cestus(Venus) 19. Daniel Boone((apt anagram))
 20. Lania 21. Kit 22. Fresco 23. Malaco 24. Surdonite 25. Gorget
 26. Enthrally 27. Tellurometer 28. Peripateta 29. Jenner 30. Del
 31. Zoopsychohist 32. Posit 33. Nabia 34. Hensia((Strad violins))
 35. Bielebkrus 36. Golgi 37. Ixion((first to murder one of his kin))
 38. Sarsotic 39. Graham's law 40. Flexor 41. Lepto- 42. Piach
 43. Luck((rhyming quote from "A Midsummer Night's Dream")) 44. Petaurine
 45. Macrophagus 46. Apodiabolois 47. Lords Temporal 48. Diluculum
 49. Rouletteing 50. Xisena

LETTER FROM KEVIN LANGDON

July 11, 1995

Dear Rick,

Chris Langan called me yesterday and we talked for about half an hour. Among other things, we talked about *Noesis*. He's very unhappy with the slow pace of publication and with the vulgarity (especially that story of yours with the explicit sex on the front cover). As I've mentioned before, I'm more philosophical about this kind of stuff, but it bothers me, too.

Quarterly publication makes dialogue very difficult. Chris worries about the credibility of *Noesis* with the public, but I'd like to see us offer something that would be more likely to attract potential members.

Chris is upset enough that he will offer to take over the editorship of *Noesis* again. I appreciate the work you've done, but, at this point, I'm inclined to support him.

Chris also mentioned that if the two problems above were corrected, he would prefer to have you stay on as Editor. I agree with this, too. And I thought you should know.

Sincerely,
 Kevin Langdon

NOTES ON THE PRODUCTION OF A 20-INCH MIRROR
by CHRIS HARDING

09-12-94 friday - I phoned Astro-Optical and established that they would be unable to accommodate a mirror above 20 inches diameter for purposes of sluitizing this due to a tank restriction. Ordered two 20 inch disks of glass in 19 mm (3/4 inch thick) polished plate glass from A.B. Glazing.

19-12-94 monday - I received my 20 inch glass disks from A.B. Glazing and began the grinding process at 2.45 p.m. using various off-centre strokes and 80 grade carbrundum finishing at 10.18 p.m. having done 4 hours and 30 minutes at that point work load split with breaks due to the weight of the mirror blank (22 lbs). After the second grinding the focal length had been estimated at 40 foot plus or minus after 1 hour and 20 minutes using the sun.

20-12-94 tuesday - 30 minutes grinding in the early morning starting at 6.30 a.m. as above which was halted by rain whilst working from the back lawn. Later tested the mirror on the sun which showed it to be better focused but focal length still around 40 foot after some 3 hours total grinding which stunned me since I'd expected it to be some what less than this. 2 hours grinding on the afternoon starting at 3.10 p.m. with a mixture of off-centre and long centre-over-centre strokes. Testing of mirror seemed to indicate it was stuck at around 40 foot focal length which appeared to be without explanation. Bob Berry came over to the house and we started grinding the mirror at 9.10 p.m. till 10.18 p.m. putting in 11 hours more work on it using off centre circular strokes. We were then just able to slip a 5 cent coin under a straight edge suspended over the face of the mirror which gave us enough encouragement to continue with it.

21-12-94 wednesday - 2 hours of off centre circular stroke. Focal length of mirror appearing to have been reduced to 29 foot from it's solar focus.

22-12-94 thursday - began 1 hours grinding using above stroke at 4.37 a.m. (then light). After 4 a.m. tested mirror's focus on the sun (which seemed quite good) and found it's focal length to be about 26 feet. Curve then deep enough to pass a 10 cent coin under a straight edge at the centre.

23-12-94 friday - Bob Berry tested the mirror during the day and got 24 foot for it's focal length - estimates still being it seems unreliable. 2 hours grinding using above stroke beginning at 8.33 p.m. and finishing at 10.40 p.m.

24-12-94 saturday - 2 hours grinding as above curve now equaling the depth of a 50 cent coin. Followed by 1 hours grinding using same style of stroke but with only 4 inches overhang.

25-12-94 sunday - 1 hours grinding as above starting at 8.40 p.m. after the rain stopped (finished at 9.45 p.m. then starting to rain again - had rained nearly all day).

26-12-94 monday - 2 hours grinding as above beginning at 3.10 p.m. and finishing at 5.25 p.m. Focal length of mirror then 17 foot 4 inches which would mean an f/ratio of 10.4 at this point - well above what we'd hoped we could meet.

27-12-94 tuesday - 2 hours grinding much as above but purposefully varying the size of the circular sweeps - beginning at 4.43 p.m. and ending at 8.30 p.m. All coins (including the 52 cent) now able to pass under the curve of the mirror and a straight edge held across it's face the 50 cent coin passing as much as 3 inches from the mirror's edge and the 51 cent 7 inches from it's edge. Out of 80 grade carbrundum at this point. Collected over half a bottle of "sludge" from the table around the 20 inch tool with the intention of recycling it. [total grinding time to this point using the 80 grade carbrundum was then 21 hours].

28-12-94 wednesday - 1 hours grinding as above using my recycled sludge. Mirror f.l. measured at 16 ft 3 ins or F/9.85. 2 hours grinding as above after sun down with breaks finishing at 9.35 p.m. Mirror surface now much smoother.

Dear Rick:

I hope you can find space for this letter and my notes on the production history for a 20 inch telescope mirror as a contribution to Noesis. Many members of the local Astronomy group said I could not do it on the grounds that the glass was far too thin and that the mirror would suffer from astigmatism because of this. One member said that a mirror of this size must have some error in its figure and that the local temperature variations being as wide as they are would create a big problem for me in the soft plate glass of the disk from which it was ground. Well he was right on the last two - I never produced a perfect job - the ghost of previous zonal errors did manage to remain just and just detectable despite long hours of effort to remove them completely and the mirror's performance goes up and down like an elevator when tested in the open air. Under conditions where my thermometer shows the air temperature as having remained stable for some hours it produces critically sharp images at the highest powers; at least for the testing apparatus: I tried to line the mirror up with the moon but the slight misalignment elongated its image making an actual functional test of performance impossible what a pity!. I'm tempted to try for a much bigger mirror having learnt that the CSIRO here in Australia do this right up to the sizes of the professional telescopes including the 156 inch anglo-australian a size well beyond any amateur. In Australia as far back as 1959 one amateur made a 30 inch in plastic and currently I've heard of a 32 inch (in 1.25 inch thick polished plate glass) and a 40 inch - sizes that are beyond me right now. The problems created by greater size will require I grind these face up with a sub-diameter or sub-radial tool. Certainly figuring the 20 inch using a full size tool proved impossible: No sooner had I removed one error than another would rear its ugly head. Finally whilst testing the mirror in my backyard with it back against a wooden box I heard the most horrible sound of my life as it moved to one side - this I found later had put a huge deep scratch in the back of the glass. Had I had this accident with the optical surface it would have been ruined forever. My notes follow.

- Chris. Harding

MY NOTES ON THE PRODUCTION HISTORY OF A 20 INCH F/9 MIRROR : Chris. Harding

Skin of my finger tips now very sore and tendons in left hand and right elbow being very painful.

29-12-94 thursday - f.l. down to 15 ft 9 ins when tested at 4.40 p.m.
2 hours 30 minutes more grinding as above after sun down.

30-12-94 friday - f.l. down to 14 ft 10 ins when tested at 5.35 p.m.
1 hour 45 minutes grinding as above after sun down. Bob Berry had come over to the house with more carbrundum and given me a hand with the mirror. [total grinding time to this point (on 80 carbrundum) now 28 hours 15 minutes].

31-12-94 saturday - re-tested the mirror at 5.10 p.m. getting an apparent f.l. of 15 ft 1 ins ie. indicating it had gone out which was a shocker !. However the quality of the focus was much neater. Decided to abandon further attempts to bring in the focus my left hand being at this point just too deteriorated to make this practical.

01-01-95 sunday - not well enough to do anything today.

02-01-95 monday - 2 hours 30 minutes grinding with highly variable circular strokes using 220 carbrundum.

03-01-95 tuesday - established at 5.35 p.m. that the f.l. of the mirror was indeed 15 ft 1 inch. Surface now greatly smoothed with a decidedly sharper focus for the sun. Pencil test appeared o.k. 1 hour 30 minutes grinding as above (hailed by rain). Examined surface of both mirror and tool with a *16 diopter lens [my myopia requires I wear *3.5 diopter glasses (far point of clear vision being 11 inches) and without this adds the effective power of the lens +17.5 reducing distance to inspection of the surface to approximately 5-1/4 inches] no evidence for any remaining 80 grade carbrundum pits being found. [total grinding time using 220 carbrundum 4 hours].

04-01-95 wednesday - 2 hours grinding as above with 400 grade carbrundum. Pencil test completely satisfactory. [total grinding time using 400 carbrundum 2 hours]. 1 hour 15 minutes grinding as above with 500 grade carbrundum.

05-01-95 thursday - 45 minutes grinding as above with 500 carbrundum. Pencil test satisfactory. [total grinding time using 500 carbrundum 2 hours]. 30 minutes grinding as above with 1000 grade carbrundum during night.

06-01-95 friday - 1 hour 45 minutes grinding as above with 1000 carbrundum at night ending 20 minutes after midnight.

07-01-95 saturday - 15 minutes grinding with 1000 carbrundum as above on the late afternoon around 4.00 p.m. but stopped when discovered that the heat of the day was drying out the water. Pencil test also failed because of this. [age of sun very sharp indeed around 5.05 p.m.]. [total grinding time using 1000 carbrundum 2 hours 30 minutes]. [total for all grades 58 hours 45 minutes].

THE FIRST ATTEMPT AT POLISHING THE MIRROR

I Prepared a full hcf lap melting the material on to the 20 inch tool using the late afternoon sunlight - a temporary job since I had no glue at this point. 1 hours polishing with cerium oxide using centre-over-centre stroke with 4 inch overhang which necessitated that I wore gloves both hands now badly deteriorated - mirror 'sticking' on the lap. Mirror polished around the edge (1.5 inches wide) less so at the very edge with very little polish in it's central region. Quite horrified by this but inspection showed the sheets of hcf were buckled where two of the sheet edges came in contact. Lengthened stroke to 6-7 inches overhang but after 15 minutes one of the sheet sections on the inside of the table came loose and slipped off. Continued for another 20 minutes with the same overhang on the side nearest to me but only about 1 inch on the far side. After this length of time the whole lap quickly broke up and fell apart. I had expected this to happen the surprise being that it held

together for a total of 1 hour 35 minutes. Polish was still very poor in the central section of the mirror. Then prepared a full cloth lap. 20 minutes of polishing with 4 inch centre-over-centre strokes only improved the central area of the mirror slightly. Testing at this point with the 'knife-edge' showed the central section to be of longer focus than the rest of the mirror which struck me as really odd and indicating there might possibly be little point in trying to complete the polishing from it's current state.

08-01-95 sunday - examined the mirror in the daylight and found the outer part of the mirror to be about 80 % fully polished and the central part about 20 % as prepared another full lap this time with glue. The odd thing was not that the centre was 'poorly' polished but that the edge regions were so 'well' polished. Started work by shaking out half a bottle of carbrundum over the hcf lap mistaking it for the cerium oxide bottle !!. Unable at this point to decontaminate the lap required I make another one. 1 hours polishing with medium length centre-over-centre strokes. Examination showed considerable improvement to polish at the central part of the mirror. However testing the figure showed it to be an absolute abomination !. There appeared still to be two separate points of focus. Without asking the mirror I had no idea of the exact difference other than to be forced into acknowledging that the difference was massive. This if known would still not tell me if I would be able to correct it. I then reduced the lap to 14 inches diameter. Polished for 35 minutes and retested. Improvement in polish to the centre of the mirror noticeable at this point. On testing there seemed a marked change in the shape of the figure. Transferred my little table come bench upstairs to my bedroom at this point that the polishing might some time later on be continued in the comfort of the airconditioning.

09-01-95 monday - 1 hour 30 minutes polishing as above. Marked improvement in surface polish noted centre now far better polished than the far edge of the disk. At 9.02 p.m. went over to Bob Berry's place with the 20 inch mirror he testing it thoroughly. Most of the surface appeared to produce an irregular set of foci within 0.5 inch of each other with the exception of the centre. After applying a number of 'stops' he discovered that the central area was as such as 2.5 inches longer focus than the surrounding surface - neither of us had seen such a mass of oddities before it truly amazed us. He was even more surprised than I that so good a polish had been obtain after just 5 hours. I felt at this point that the key to the problem of correcting the figure was firstly an attack on the central hill. Once that was dealt with it might be possible to make a better assessment of the situation. Our only quote was to go back to the original grinding - to go back to first principles. The problem here would centre on the unpredictability of creating a second surface that could be polished as quickly. Since neither approach resulted in anything other than pure speculation I decided to try to continue to polish my way out of trouble.

10-01-95 tuesday - Cut the lap down to 10 inches diameter. 1 hour 10 minutes polishing as above in the early morning. A slight improvement evident ie. towards the removal of the central 'hill'. Cut lap down further to 9 inch diameter on the night. 35 minutes polishing using long centre-over-centre stroke. 'Hill' further reduced though work appeared slow.

11-01-95 wednesday - 45 minutes polishing with some what shorter strokes than above beginning at 6.08 a.m. Further progress evident. 1 hour 20 minutes polishing at night as in the morning. Progress appeared to have slowed down some what at this point. Further testing showed that the focal plane between the inner and outer sections of the mirror were now within 1.2 inches of each other. Whilst before a reasonable image could be obtain from either focus they were now close enough to 'overlap' each other giving a region of minuscule blur !!. Prepared a full lap at this point having decided to try to 'flatten' the edge out.

12-01-95 thursday - 1 hour 20 minutes polishing using extremely short centre-over-centre strokes over a 20 inch diameter lap. Initial impression was that this had little or no impact on the mirror - then looked at the disk size of one of the 'point objects' when the other was 'in focus' which indicated

the two foci were 0.63 of an inch apart.

13-01-95 friday - cut out a 3 inch circular hcf section and stuck it over the centre of the full hcf lap. My reasoning being that this circular raised area would allow me to polish away the central hill approximately 44 times as fast as any known stroke over the full lap. To my surprise this compressed the material of the previous layer over the tool. 1 hour 23 minutes polishing using very short centre-over-centre strokes followed. On testing the mirror found the two foci were now within 0.39 of an inch of each other. Combined they had started to form a single but very blurred image of my touch stone into the mirror at the radius of curvature using a 23 mm eye piece ie. at x400.

14-01-95 saturday - 1 hour 20 minutes polishing using 45 X overhang centre-over-centre. foci now within 0.36 of an inch of each other. At x400 image now showing obvious signs of focusing.

15-01-95 sunday - 3 hours 3 minutes polishing as above. During the later stages part of the 3 inch inner section (previously stuck on) broke up and had to be removed. Testing showed all foci to be within 0.33 of an inch of each other. For first time saw 'twinkling' of image due to thermal effects indicating the mirror was 'starting to come good' though having a long way to go still. Suspecting damage to surface covered by the 3 inch patch I removed the remainder of it.

16-01-95 monday - 2 hours 5 minutes polishing as above. All foci now within 0.31 of an inch of each other. Image at x400 considerably improved. Images at x724 could now be focused.

17-01-95 tuesday - 4 hours 23 minutes polishing as above. On testing the mirror found the foci within 0.28 of an inch of each other. However while testing it became aware that the mirror image had some how developed a 'misty' look about it suggesting that the surface was accumulating damage from either the worn down hcf sheets or the cerium oxide or both. I had used water throughout and it was suggested to me that 'fine scratching' effects might arise as the water dried out. Since I could not pin point the cause of the difficulty I decided to stop using the water mixture. (Total polishing time using water cerium oxide and hcf 23 hours).

18-01-95 wednesday - I got 5 bottles of machine oil today. Bob Berry came over to the house and testing the mirror we then put in 1 hour polishing using the hcf cerium oxide and the machine oil. We were quite stunned by the ease by which we could move the 20 mirror over a full size lap. We found some improvement to the damaged surface but no change in the mirror's figure which suggested that by time the figure was corrected the surface might be too damaged altogether ie. not using the oil. Since an image had developed it was decided to return the mirror to the fine grinding stage. We both decided at this point to abandon all future use of cerium oxide rather than take any further risks with it. We were also interested in seeing what effect if any the oil would have on ease of use during grinding. The later stages of grinding would also quickly correct obvious figure errors. At this point the set up was moved back down into the back garden once again the grinding being too messy to be done inside the house. (Total polishing time 24 hours \ total time spent to this point 42 hours 45 minutes).

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THE SECOND GRINDING

19-01-95 thursday - Bob Berry phoned at 11.10 a.m. having previously brought over some more of the various grades of carbrundum and rouge but been unable to get me to answer the door (ie. unable to rouse me from sleep!). I began re-grinding the mirror on the very late afternoon completing 2 hours 20 minutes with grade 400 carbrundum using only centre-over-centre strokes averaging 3 inch overhang but varying in the range from 2 to 4 inches.

20-01-95 friday - not well enough to do anything today.

21-01-95 saturday - Bob Berry put in 2 hours 13 minutes with 400 carbrundum using 1 1/2 inch overhang centre-over-centre strokes. The pencil test results indicate at this point that the 20 inch tool was being worn to some extent by the table though making reasonable contact with the mirror disk.

22-01-95 sunday - 30 minutes grinding as above with the 400 grade carbrundum. (total time on the second grinding using 400 grade carbrundum 3 hours 03 minutes). 2 hours 15 minutes grinding with 500 grade carbrundum using 1 inch overhang centre-over-centre strokes. (total time on the second grinding attempt using 500 grade carbrundum 2 hours 15 minutes).

23-01-95 monday - not well enough to do anything today.

24-01-95 tuesday - not well enough to do anything today.

25-01-95 wednesday - 3 hours grinding with 1 inch overhanging centre-over-centre stroke with 1000 grade carbrundum. Felt very smooth in action over the tool. (total grinding time on 1000 grade carbrundum 3 hours. total time on the second grinding 10 hours 20 minutes. total time spent to this point 73 hours 03 minutes).

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THE SECOND POLISHING

26-01-95 thursday - prepared a full size hcf lap after sundown (using glue) but this broke up after 2-3 minutes. Prepared a second lap (using the same type of glue) but this again failed after a similar time. Tried a third time but again this failed too. (total time 7 minutes using 2 inch overhang in the centre-over-centre stroke with tin-oxide and machine oil). Then tried to polish the mirror on a glass-over-glass basis with the tin-oxide and machine oil again using above actions for 25 minutes. (total 'polishing' time 30 minutes).

27-01-95 friday - I bought some industrial strength glue and prepared a full size hcf lap letting the whole thing 'melt' in the heat of the afternoon sunlight. Left it overnight so as to allow it to do the same the following day before making any further attempt at polishing the mirror.

28-01-95 saturday - around 12.45 a.m. I was horrified to find the hcf lap turning rapidly into 'liquid ooze' in the heat of the midday sun (on a typical summer's day) then being too late to do anything about it. About a minute after I noticed this it had started to pour off the tool disk and then even more quickly off the table. Strangely what was left of the lap did not feel all that hot to the touch. In the late afternoon made yet another lap. 1 hour polishing using tin oxide and machine oil using variable short strokes centre-over-centre but by then disappointed with the rate of polishing of the mirror's surface. Transferred the setup upstairs to my bedroom once again.

29-01-95 sunday - 2 hours polishing as above. At this point had established that the machine oil whilst probably preventing scratches may have totally inhibited the polishing action of the tin oxide. Cleaned everything up then using only water with the tin oxide did a further 2 hours 45 minutes using the same stroke as before. Gave up as the lap began to break up at the edges. Now suggestion that despite (to my hands) a painful drag between the mirror and lap (having had no effect on the surface) that the tin oxide can not produce any polishing action on the mirror's surface. I was quite shocked as I'd been assured by the supplier that it would give a good polish. At this point prepared yet another lap.

30-01-95 monday - 1 hour 10 minutes using above stroke but with the old cerium oxide and this time with machine oil. Some improvement in the polish but on examination with a powerfull magnifying glass found small scratches starting to appear ie. the machine oil was no protection against the destructive side effects of the cerium oxide (the contents of this bottle of material I now felt sure needed only be lined into the rubbish bin!). Then

already too late to save the mirror surface which would have to be returned to the fine grinding once again. (total polishing time on second attempt at this 7 hour 25 minutes and total time spent to this point 80 hours 30 minutes).

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THE THIRD GRINDING

31-01-95 tuesday - 1 hour 25 minutes grinding using 500 grade carbrundum with short centre-over-centre strokes. (total time spent on the third attempt at grinding the mirror with 500 grade carbrundum 1 hour 25 minutes).

01-02-95 wednesday - 2 hours 50 minutes grinding using 1000 grade carbrundum using centre-over-centre stroke with 1/2 to 1 inch overhang. Tested contact between disks at this point (twice) using "biro test" and found this to be perfect each time. (total time spent on the third attempt at grinding the mirror with 1000 grade carbrundum 2 hours 30 minutes).

02-02-95 thursday - 40 minutes "grinding" using above stroke with tin oxide in the hope of putting on some further "condition" to the surface of the mirror. (total time spent on tin oxide "grade" 40 minutes. \ (total time spent on third attempt at grinding mirror 4 hour 35 minutes).

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THE THIRD POLISHING

02-02-95 Bob Berry and I made a full size hcf lap after he came over to the house at 9.05 p.m. He tested the mirror by wetting the surface there being insufficient polish on the surface to conduct a normal test but came to the conclusion that it was spherical none-the-less. We noticed that the mirror's focal length had increased 1/2.

03-02-95 friday - 1 hours 30 minutes polishing with hcf and tin oxide and water with 1 to 1.5 inch overhang centre-over-centre strokes. Mirror appeared to polish evenly though slowly over it's entire surface.

04-02-95 saturday - 30 minutes polishing as above during the day. Bob Berry later came over to the house on the night we testing the mirror thoroughly (then estimating that it was 15 to 25 % polished :) we later doing 1 hour polishing between us using long centre-over-centre strokes with the tin oxide and water. Initially we had a problem with the hcf lap starting to break up within the first 2-3 minutes but we repaired the damage in time. On retesting of the mirror we found it had within the time we'd spent on it improved considerably but was still shallower than a sphere. At this stage it appeared free of zonal irregularities and all foci fell within 0.17 of an inch of each other.

05-02-95 sunday - 1 hours polishing as above showing a considerable improvement to the mirror surface.

06-02-95 monday - 2 hours polishing as above. Tested mirror - some improvement in evidence. Image of torch at x724 plus (12.5 mm eye piece) able to be focused. Could see central filament of torch with this power but focus not really "good". I then did 2 hours further polishing as above then retesting the mirror noted further improvements to the figure. Mirror fully polished in the centre.

07-02-95 tuesday - 2 hour 30 minutes polishing as above. Surface continued to improve. Figure nearer to spherical.

08-02-95 wednesday - 2 hours 30 minutes polishing as above. Further improvement in surface of mirror evident. Figure also further improved and now indicating that the mirror is almost spherical (which now fully supports

10-02-95 friday - 1 hour 15 minutes polishing as above. Surface continues to improve. Figure for the first time very slightly deeper than a sphere though this still being an undercorrection. Image now clear with the 12.5 mm s.p.

11-02-95 saturday - 2 hours 5 minutes polishing with centre-over-centre strokes with 4 inch overhang on face side of tool and 8 inch overhang on the near side. Further surface polish evident; the quality of the polish now spreading more towards the mirror's edge; it being certainly fully polished in the central area. Mirror under test was just slightly too shallow on average but now of irregular depth. The image at x724 (*) was very sharp despite the irregular depth of the mirror. I cut out a smallish slightly irregular and slightly off-centre star figure from the central area of the hcf lap. 40 minutes polishing with long centre-over-centre stroke. On re-test the irregularities previously evident in the mirror's figure had lessened under the knife-edge test.

12-02-95 sunday - 1 hours polishing as above. Examination showed the mirror surface appearing save for about 3/4 inch of the edge which still had a slightly cloudy look about it. Testing showed a slightly up turned edge. Average dept then between a sphere and a parabola. 1 hours polishing using variable strokes beginning with short strokes going to medium length then long before cycling through the range once again all using centre-over-centre. Slight improvement evident but the torch batteries starting to fail made testing difficult during the day. 40 minutes polishing using medium length centre-over-centre strokes. Bob Berry came over to the house with his testing apparatus and he & I set about testing the mirror at this point finding all foci falling within 25 mm of each other (being slightly undercorrected overall the centre being relatively depressed and the edge of the mirror turned up if one drew a line through the averaged curve). Much of the problem appeared not to be "normal" but to be due to an "induced" astigmatism we concluding that the tool was inadequately supported. Our proposed remedy for this was to place a 12 inch cardboard disk beneath the tool in the hope that this would work ?. I then took a piece out of the side of the central star figure from the lap.

13-02-95 monday - 1 hour 5 minutes polishing using medium centre-over-centre strokes. Tested mirror which seemed greatly smoothed though shallower. 1 hour 10 minutes polishing using 4 inch overhang strokes in the manner above. Testing mirror indicated little or no change in the mirror's figure.

14-02-95 tuesday - 1 hour 30 minutes polishing using very long centre-over-centre strokes. Tests on mirror indicating little change. Then cut out a further small section of the lap at the original sight. 1 hours polishing again using very long strokes as above. Testing showed a small change in the right direction.

15-02-95 wednesday - 1 hours polishing as above. Testing suggesting the figuring had once again stalled. Cut another (longer) star tail from the lap.

16-02-95 thursday - 1 hours polishing as above. Testing indicating the same result. Cut lap further greatly enlarging the star. 1 hour 5 minutes polishing as above. Testing still indicating the same result i.e. the central depressed area would not budge. Bob Berry came over to the house and tested the mirror; at first impressed by the quality of the images produced by it - this being improved considerably (which surprised him) - but discovering that the centre had become more depressed; we both estimating a discrepancy of 1.28 inches !. This appeared seemingly contradictory !!. We both concluded that the long stroke had won out over the star cut out.

1 hours polishing using short centre-over-centre strokes testing revealing very little change. 1 hours polishing as above testing again pretty negative. Performed "radical surgery" on the star cut-out greatly

18-02-95 saturday - 1 hour polishing as above but without "re-charging" the lap using only water in order to increase "drag" testing showing no change at all.

19-02-95 sunday - 1 hour 15 minutes polishing using medium length centre-over-centre strokes. Tests on mirror showed an improvement in the figure which was very noticeable. 1 hour 10 minutes polishing as above. Tests on mirror indicating further improvement. Centre less depressed. All foci within 0.7 inches of the needed/corrected curve.

20-02-95 monday - 2 hours 10 minutes polishing as above. Tests indicating foci now within 0.44 inches of n/c curve. 50 minutes polishing using medium length centre-over-centre strokes testing showing dispersion having increased to 0.77 inches indicating it was the wrong thing to do !.

21-02-95 tuesday - 30 minutes polishing using centre-over-centre stroke with the strokes in the 2-3 inch overhang range. Negligible change. 30 minutes polishing shortening stroke to 1 inch. Image appeared sharper.

22-02-95 wednesday - 1 hour 40 minutes polishing as above. Testing indicating the trend was correct. I did a further 35 minutes polishing as above. Too late to test mirror at this point.

23-02-95 thursday - 30 minutes polishing as above. Mirror continues to improve. Appearance of the central depression under the knife edge test now much reduced. Slight haze still remains around the mirror's edge though indicating it is still not fully polished. Latest efforts confirm the correctness of the actions. 1 hour 15 minutes further polishing as above. Too late once again to test mirror.

24-02-95 friday - 1 hour 25 minutes polishing as above. Mirror appeared flatter though the depressed centre still remained evident. Made a new full size lap at this point.

25-02-95 saturday - 30 minutes polishing as above on the new full size lap. Testing showed an under corrected mirror having a depressed centre which appeared unchanged from before but now showed a "ring" between the centre and edge slightly less polished than the overall surface but not comparably so to the edge. Mere visual inspection of the glass to a light background of course showed no such problem. Observing the touch with a 12.5 mm s.p. [at a power of around x740] gave a sharp image.

26-02-95 sunday - 2 hours 15 minutes polishing as above. Bob Berry came over to the house and tested the mirror thoroughly at this point. He thought the mirror had improved very considerably since his last visit. He blocked out 4 inches of the mirror's centre and got crystal sharp images though the images were very sharp without this. Since I had run out of tin oxide of my own we used this as an excuse to try out the high optical grade cerium oxide I'd purchased from Astro Optical. Bob Berry found it too stiff to push as I'd applied it on the lap so I found myself putting in 1 hour's polishing with our agreed upon centre-over-centre stroke using a 2 1/2 inch overhang. The moment we came to test the mirror we were blown away by the changes !. Previously the mirror had been very slightly deeper than a sphere with a depressed centre about 5 1/2 inches across. In place of this we then had a mirror of approximately correct "parabolic depth" with a very slight depressed centre only 1 1/2 inches across with 4 rings between the centre and the edge. We'd been told the high optical grade cerium oxide would polish 10 times as fast as the tin oxide but found this hard to believe. The 1 hour's polishing almost killed me as my hands bruised badly as a result of the force I needed to apply. The star images appeared ok, with neat diffraction rings on both sides of the "bus but the overall quality of the mirror had gone down considerably no doubt due to the 4 rings.

27-02-95 monday - 1 hour polishing as above. Mixture had been applied. Test. Testing indicated that the mirror appeared unchanged which certainly surprised me. 1 hour 20 minutes polishing using centre-over-centre stroke with

1 inch overhang. Testing showed the mirror to have become flatter and the zone now less distinct.

28-02-95 tuesday - 1 hour 5 minutes polishing as above. Testing mirror showed it had continued it's trend towards becoming shallower. However the problem with zonal irregularities had shown no improvement during this time. Against this the mirror's edge was now close to being completely polished ie. the mirror was now nearly 100% polished over it's entire surface thus generalising that this would not in future be any kind of problem needing the attention it had received to that point !. A further negative was the decline of the mirror's edge forming quality. 1 hour 15 minutes polishing using centre-over-centre strokes cycling through the range from short to long beginning each time with short strokes. Tested mirror again finding that it was then deeper the zonal irregularities having lessened also. There appeared a general trend for the deepening to be more confined to the central area. The image had sharpened again.

01-02-95 wednesday - 1 hour 20 minutes polishing in the manner above but with the stroke range reduced from 1 to 4 inches. Testing showed the mirror slightly undercorrected zones reduced and images sharper.

02-03-95 thursday - 1 hour's polishing using centre-over-centre stroke with 2 1/2 inch overhang. Testing of mirror showed it had "gone to the dogs" then nearly spherical; central depressed area still in evidence; zonal irregularities having lessened the "fuzzy" nature of it's images being due to the undercorrection of the mirror rather than anything else !. 30 minutes polishing having lengthened the stroke above to 4 inches overhang. Tried to do an immediate test on the mirror but this proved nearly impossible but suggested there wasn't really much change.

03-03-95 friday - 1 hour's polishing as above with 8 inch overhang. Again failed to get accurate readings during the day "seeing conditions" being too bright with impression that the mirror has once again defied "logic". 1 hour 20 minutes polishing using a 4 inch displaced (from centre-over-centre with medium to long strokes. The pattern of the error then completely changed again. The former zonal irregularities had disappeared and the depressed central area had spread out to a diameter of 12 inches the area outside of this being spherical ie. the mirror had been deepened further out. 40 minutes polishing as above without any apparent change in the mirror's figure. 1 hour 25 minutes polishing using strict centre-over-centre strokes with 4 inch overhang. Testin showed the figure at least having tended towards correction during this time.

04-03-95 saturday - 2 hours 5 minutes polishing as above. Test showed a very considerable change in the right direction.

05-03-95 sunday - 1 hour 40 minutes polishing as above. Bob Berry came over to the house and we tested the mirror. There had been little change. I did 1 hour's polishing as above. We then retested the mirror. Again noting almost no change.

06-03-95 monday - 1 hour 25 minutes polishing as above. I adjusted the mixture of cerium oxide & water to make it as difficult as I could stand up to in moving the mirror over the lap needing to use my weight (204 lbs) to budge it !. Testing showed the trend to have begun again; the central area of the mirror having come closer into alignment with the rest of the surface. 1 hour 35 minutes polishing attempting to duplicate the previous efforts. Testing showed the trend had continued but at no great rate. Images appeared clear at x740. At this point I cut out a triangular area from the centre of the lap.

07-03-95 tuesday - 1 hour's polishing as above. Trend appearing to continue. 1 hour's polishing lengthening the stroke to an 8 inch overhang. Centre now appeared to have reversed and dropped in again the stroke being too long !.

08-03-95 wednesday - 2 hours 10 minutes polishing having shortened the length of the stroke to 4 inches as previous. Testing showed the mirror had then lost most of it's former "disabilities" !. 1 hour 20 minutes polishing as

above. On testing mirror 'defects' then hard to detect. At x740 the mirror's images were the sharpest they'd ever been.

09-03-95 thursday - 1 hour 5 minutes polishing as above. Mirror now free of zonal irregularities and a little deeper than a sphere. Now only requiring it be systematically deepened into the full parabola.

10-03-95 friday - 35 minutes polishing extending the stroke to 7 inches. Testing again showed the mirror had regressed as it had done before.

11-03-95 saturday - 2 hours 10 minutes polishing with the stroke reduced to 4 inches. Testing showed the mirror now shallower than a sphere - zonality being still in evidence. Ideal stroke would now appear to be in the 5-6 inch range. 7. 30 minutes polishing using a 7 inch stroke. Testing showed the trend having been reversed but the overall effect across the mirror seems to suggest a 'warping' of the figure (the removed central portion of the lap creating a difficulty in the removal of the central area for a long stroke whilst reversing the undercorrection for the mirror figure). 30 minutes polishing using a 7 inch stroke. Testing showing the mirror flatter.

12-03-95 sunday - 2 hours 15 minutes polishing with a 6 inch stroke. Testing showed the mirror to be a sphere with a turned down edge. I cut 3 'nicks' out of the outer rim of the lap at this point.

13-03-95 monday - 35 minutes polishing as above. Testing showed persistence of the same pattern. Then cut another 3 'nicks' out of the edge of the lap. 40 minutes polishing using above strokes. Testing: figure of mirror flattening again. 45 minutes polishing with above stroke. Testing: the turned down edge having lessened but the centre now becoming depressed. Images once again clear at x740. I removed another small section from the centre of the lap in order to slow this down.

14-03-95 tuesday - 1 hour polishing as above. Testing: Only a slight improvement evident.

15-03-95 wednesday - 1 hour 40 minutes polishing as above. Testing: Mirror then a flat surface with a 'raised ring' about 10 inches in diameter.

16-03-95 thursday - 1 hour polishing as above excepting the minimization of the spin of the mirror disk at the end of the stroke action. Testing: No noticeable change to the mirror's figure. I cut 'nicks' out all round the lap edge at this point.

17-03-95 friday - Reverting to the previous type action and stroke I did a further 1 hour polishing. Testing showed a similar pattern to the mirror's figure but this now more 'blended' image at x740 now much clearer and quite sharp. 1 hour 25 minutes polishing as above. Testing then showing that the mirror had 'gone to pieces' once again. I was shocked !! There appeared to be no reason for this or none that I could find.

18-03-95 saturday - 1 hour polishing reducing the stroke length to 4 inches. Testing showed the mirror to be a sphere now badly ridged with zonal rings. Surprisingly the images produced by it were easily focusable at x740.

19-03-95 sunday - 30 minutes polishing with 5 inch strokes using a little machine oil to reduce friction. Testing showed the mirror slightly deeper than a sphere with one inner zone. At x740 the images were once again very sharp the coil of the wick of the torch very distinct with a slight haze around it. I increased the cut-away from the centre of the lap believing the only error now lay in the centre of the mirror. 35 minutes polishing as above with machine oil added into the mix of water and cerium oxide. Testing showed the central defect to have lessened but zonal irregularities having reemerged with a general trend towards flatterness of the mirror's figure. Images not quite as sharp as before indicating that a 5 inch stroke may be too short. With the additional area of the lap cut away.

20-03-95 monday - 35 minutes polishing with a 6 inch stroke using oil as above. Testing showed further decline in the quality of the mirror's focus which was now spherical with a worsening of its central parts. As a consequence I removed the full hex lap feeling the situation with the old one had by now become quite impossible !.

21-03-95 tuesday - 20 minutes polishing on the full lap with centre-over-centre stroke with 2 inch overhang using a mixture of machine-oil and water with the cerium oxide. Testing showed mirror shallower than a sphere with lessened zonal irregularities and strangely with good image property. 40 minutes polishing as above with the stroke lengthened to 3 inches. Testing showed the mirror slightly deeper than a sphere with some reduction in zonal irregularities. Images markedly sharper and quite sharp at x740. 50 minutes polishing as above. Testing indicating the mirror had back-tracked a little less, was now more like it was after the first attempt at polishing on the current full lap. 40 minutes polishing as above with the length of the strokes increased into the 4-5 inch range. Slight improvement.

22-03-95 wednesday - 25 minutes polishing using varied long strokes. Testing indicated no observable change.

23-03-95 thursday - 40 minutes polishing as above but this time leaving out the machine oil. Testing showed a slight improvement in the figure.

24-03-95 friday - 30 minutes polishing as above with just a spot of oil included in the mixture. Testing: Mirror slightly deeper irregularity still remaining. 35 minutes polishing as above without the oil. Testing: Slight change in the correct direction. Images at x740 sharp.

25-03-95 saturday - 45 minutes polishing as above. Testing: mirror figure seeming foggy ?.

26-03-95 sunday - 1 hour 45 minutes polishing as above the new exception being that I mixed the cerium oxide with water and then poured it over the lap (endeavouring to reduce the zonal errors) previously having scattered it over the lap first. Testing: depth of figure slightly increased but I doubted any reduction in the mirror's zones.

27-03-95 monday - 2 hours polishing as above. Testing showed the mirror was still undercorrected but with less evidence of zonal errors indicating the strategy was working if slowly. Images at x740 were then critically sharp which surprised me a little.

28-03-95 tuesday - 1 hour 25 minutes polishing as above. Testing indicated zonal errors had further decreased. 1 hour 35 minutes further polishing than too late to test the mirror.

29-03-95 wednesday - 1 hour 25 minutes polishing as above. Testing showed that the mirror was still slightly undercorrected though the depth had increased slightly and the zonal errors had further decreased. Images seemed only slightly sharper at x740 which were now quite impressive. Bob Berry came to the house after phoning me about the mirror. We tested both the 16 inch and 20 inch at this point; he declaring that the 20 inch was on a par with the 16 and that the 20 inch was functioning better than at any time till then. We were able to produce clear images at x2287 with the 20 inch. We both felt that small errors in the mirror's figure (still detectable) could not be corrected using cerium oxide and that a return to the slower acting tin oxide was a must if any gain was to take place. (Total time on 3rd polishing attempt to this point was 109 hours and 5 minutes).

30-03-95 thursday - 40 minutes polishing as above but with tin oxide. At this point I became suspicious that the quality of the polish might have degraded. Testing also provided doubts about the figure. At this point I cut a tapering section from the lap (widest at the centre and spanning almost the entirety of its width) in the hope of lessening the depressed centre of

the mirror if nothing else !.

31-03-95 Friday - 35 minutes polishing as above. Testing indicated no discernable change.

01-04-95 Saturday - 1 hour 45 minutes polishing as above. Testing showed the mirror had deteriorated slightly but quite how was a mystery ?. At this point I cut the taper in the lap to be wider in the centre by about twice. Bob Berry who also tested it suggested the change was thermal ?.

02-04-95 Sunday - 1 hour 25 minutes polishing as above. Testing showed a slight improvement with images quite sharp again with a power of x740. I then cut out a larger section from the centre feeling that the central depressed area needed to be dealt with more so than the zonal errors.

03-04-95 Monday - 30 minutes polishing as above. Testing the mirror I noticed that about 15 inches of the central portion of it's surface had regressed to the level of a 'fuzzy patch' !. This horrified me - I resolved to abandon any further work with the tin oxide which quite obviously gave an inferior polish to that of the optical grade cerium oxide. Visual inspection showed the glass just slightly more polished at it's edge where before I had no such problem. [Total time on 3rd polishing attempt to this point had been 118 hours 40 minutes].

04-04-95 Tuesday - I made a new full hcf lap today. 1 hour 10 minutes with 2-3 inch strokes in the polishing using 'tea tree' soap with very finely watered cerium oxide. Testing showed that the mirror was of approximately the correct depth but riddled with zones the 'fuzzy' area in the centre having lessened. Mirror images once again had a 'hopeless' look about it.

05-04-95 Wednesday - 55 minutes polishing employing at 1 1/2 inch overhang stroke this time having used a 'sludge' approach to pouring the cerium oxide. Testing showed that the mirror had become shallower with lessened zonal irregularities - then evidence of a turned down edge suggesting the stroke was too short. Images too dim in the morning light to test for degree of absence there of 'sharpness' but what I could make out of it was off putting to say the least (the touch batteries having run down too much again!).

06-04-95 Thursday - 1 hour 15 minutes polishing using a 1 1/2 inch stroke with a medium mixture of cerium oxide. Regretfully testing ceased.

07-04-95 Friday - 40 minutes polishing with a 'watery thin' mixture of cerium oxide. Testing showed the mirror overall depth correct but the edge was turned down. In place of the previous pattern of zonal errors the mirror now appeared like the surface of a vinyl record so numerous were the small zonal errors !. My impression at this point was that the failure to produce good images was due to the turned down edge rather than anything else ?.

08-04-95 Saturday - 2 hours 5 minutes polishing as above using 1 to 1-1/2 inch strokes. Testing showed marginal gains over all surface errors over this period.

09-04-95 Sunday - 1 hour 5 minutes polishing as above but with the stroke length reduced to 1 inch. Testing showed the mirror irregularities further reduced but mirror then under corrected and image quality much worsened probably because the stroke was too short altogether.

10-04-95 Monday - 1 hours polishing as above but with the stroke lengthened to 1.5 inches. Testing once again perplexed by the mirror's refusal to make any sense since no gain could be found.

11-04-95 Tuesday - not well enough to do anything today.

12-04-95 Wednesday - 30 minutes polishing using 'thin' cerium oxide with a one-sided stroke with a 3 inch overhang on the far side of the lap - a style of stroke used successfully on the previous 16 inch mirror. Testing showed

that the zones had lessened slightly but images still blurred.

13-04-95 Thursday - 1 hour 5 minutes polishing as above but the stroke lengthened to 4 inches. Testing showed the mirror undercorrected still having zones; and with a turned down edge. Images slightly less blurred.

14-04-95 Friday - 2 hours 10 minutes polishing as above but with the stroke lengthened to 4 inches. Total time spent on the 3rd polishing attempt to this point 125 hours 55 minutes (having then run out of cerium oxide). Testing showed a similar pattern persisting as before the images having become quite sharp at x740 indicating the mirror was creeping back to a normalised state if nothing else ?.

15-04-95 Saturday - not well enough to do anything today.

16-04-95 Sunday - 1 hour 15 minutes polishing as above except that this time I used stick rouge. Testing showed zones had a slightly lessened look with an improved sharpness to the image at x740 at which point it could only be described as very sharp.

17-04-95 Monday - 50 minutes polishing as above. Testing showed little gain.

18-04-95 Tuesday - not well enough to do anything today.

19-04-95 Wednesday - not well enough to do anything today.

20-04-95 Thursday - 40 minutes polishing as above this time using Womens' lipstick ! (and water). Then did another 40 minutes polishing as above adding some machine oil to the mix. Testing this time showing the mirror a little deeper and images slightly clearer but with zones still stalking it's face though.

21-04-95 Friday - 25 minutes polishing as above this time using a talcum powder and water mixture !. Testing showed no observable change. [Total time on 3rd polishing attempt 129 hours 45 minutes to this point].

29-04-95 Saturday - resumed polishing of the 20 inch f/9 mirror today doing 1 hour 15 minutes as above having gotten a new supply of cerium oxide yesterday. (from Altra-vue optics in Melbourne) said by them to be of the variety used for the professional observatories.

30-04-95 Sunday - Bob Berry came to the house today so we set about testing the mirror. Images appeared sharp with my newly acquired 6 mm eye piece ie. x1525 at the radius of curvature but zonal irregularities still manage to persist. Too exhausted to put any further effort into the mirror at this point in time.

01-05-95 Monday - 1 hours polishing using the W-stroke at medium length. Testing showed a slight decrease in zonal irregularity but still quite evident as a problem. All foci now within 0.18 of an inch of the proper correction. 2 hours polishing as above. Testing showed the zones as further decreased.

02-05-95 Tuesday - 2 hours polishing as above. Testing showed sharp to very sharp images with x1525 with a further decrease in zonal errors which appeared very minor; all foci being within 0.1 of an inch of each other for the theoretical mirror.

03-05-95 Wednesday - 1 hour 30 minutes polishing as above. Testing showed all major 'zonal' errors had been removed the only such fault remaining being a more general 'sweep' to the curve. Images critically sharp at x1525. All foci now within 0.05 of an inch of each other.

04-05-95 Thursday - 2 hours 15 minutes polishing as above. Testing showed the general 'sweep' above to have lessened considerably. Images now 'as sharp as a tack' at x1525.

05-05-95 Friday - 4 hours 25 minutes polishing as above. Testing indicated that the mirror had now thrown up a single raised ring though this so far had not caused any apparent regression to the quality of it's images. My guess at this point was that either the w-stroke was too narrow or that it may have been the pressure needed to polish the mirror that had caused the damage i.e. the mixture may have been too thick ?. It did seem likely that any 'drag' between the mirror surface and h.c.f. lap would result in the build up of damage i.e. the w-stroke would not cope with this. At this point I had left the mirror on the lap I had the need to resort to a hammer and a block of wood to get the mirror free of the lap !. I had not struck this effect in the polishing before.

06-05-95 Saturday - 2 hours polishing as above with the addition of a soapy liquid to the mix which I'd then poured on to the centre of the lap to flatten with the weight of the mirror to spread it. The 'drag' was still noticeable but created less stress on me to push the mirror across the tool and was perhaps just about 'right' ?. Testing showed the faults sighted above to be reduced some what.

07-05-95 Sunday - 1 hour polishing as above. Testing showed zonal errors lessened. A further 1 hour polishing as above. Testing showed very little change for the better !. At this point I felt at a loss as to what I might actually do to improve matters since any gain if it existed at all (?) might not continue. The w-stroke I felt did 'flatten' the mirror surface. I had found it very difficult to control the level of 'stickiness' which in itself had worked against the levelling of errors.

08-05-95 Monday - not well enough to do anything today.

09-05-95 Tuesday - In just 12 minutes polishing (as above) the h.c.f. lap broke up needing repair. I then did a further 1 hour polishing as above a section of the lap still remaining "loose" despite my best efforts repeatedly to secure it. Testing showed the zonal error had "kicked up" once again. The mirror appeared to have become slightly shallower adding to my problems. This proved very surprising to me. I had repeatedly tried in vain to make the mixture more slippery in order to breakdown probable damage to the surface. This was a complete failure. I then did another 18 minutes polishing (13 minutes in which the offending section of the h.c.f. lap tore off completely ... I ignoring it this time !!) using a longer wider bigger w-stroke ignoring the degree of "grab" quite evident during that time which had become much worse. Testing showed the raised zone had collapsed almost out of sight with a general deepening overall. I did another 40 minutes polishing as above. Testing showed the raised ring had once again appeared but this time the centre of the mirror had gone in creating a depressed centre. I did another 50 minutes polishing reducing the scale of the w-stroke to a minimum. Testing showed previous errors considerably reduced indicating future directions. Image of torch scratches very sharp once again at the x1525 power level.

10-05-95 Wednesday - 1 hours 30 minutes polishing as above. Testing showed the knife-edge straighter i.e. a reduction in surface error but when I came to look at the images formed even the x400 power could not be focused it was so soupy and terrible. While I did not have lower powered e.p.'s available to me to carry out tests it seemed that the mirror would not have formed sharp images even as low as x100 or even x50 ?. At this point I recognised that the various tests applied to the mirror were totally at odds with one another. This was so perplexing to me I did not know what to conclude. IT WAS AS THOUGH A DEMON WERE PLAYING A GAME WITH ME. After much thought on the matter it occurred to me that pressures applied to the mirror had some how 'rinkled' the surface ?. While I had no proof for this idea I noticed I was getting better results (sometimes) when I'd used soap in the mixture though I was not able to regulate this with any exactitude.

11-05-95 Thursday - 1 hour 20 minutes polishing as above but for the use of machine oil which I several times smeared on the face of the mirror. Mirror had glided across the tool for the most part. Testing showed the mirror's images

had made a return to reasonable clarity at x400.

12-05-95 Friday - 2 hours polishing as above. Testing showed images now sharp at x400 and having reasonable clarity at x740 though not sharp.

13-05-95 Saturday - not well enough to do anything today.

14-05-95 Sunday - 1 hour 40 minutes polishing as above. Testing showed images once again sharp at x740 though zonal errors were still in evidence.

15-05-95 Monday - 2 hours 30 minutes polishing as above. Testing showed the figuring once again at a standstill. I then cut away a section (some what smaller) on the other side of the lap in an effort to lessen the effect of a turned down edge which had refused to be corrected. 1 hour 45 minutes polish as above. Testing showed the figure as "moving" once again.

16-05-95 Tuesday - 1 hour 30 minutes polishing as above. Testing showed the figure continuing to improve.

17-05-95 Wednesday - 1 hour 30 minutes polishing as above. Testing showed once again a slow down in the trend. Zones still in evidence despite images being super sharp at x740 and quite sharp at x1525 which continued to strike me as odd to say the least. (total time on 3rd polishing attempt using the 20 inch tool with the mirror face down 164 hours 55 minutes).

18-05-95 Friday - 20 minutes polishing using a 3 inch tool (from a 1/4 inch thick flat glass blank with 3 layers of h.c.f. glued on to one side with the glue in the centre and the h.c.f. squeezed at the edges with my fingers to try to compensate for the fact that the glass was flat) which I'd prepared before starting polishing using it in a springlike stroke with the 20 inch mirror face up. I tried to make this random-like for the most part (15 minutes) with the stroke confined to a region between the centre and edge (15 minutes) these strokes interspersed. Testing showed some possible reduction in zonal errors. 1 hour 50 minutes polishing using the above technique using a variety of spiral strokes. Testing showed images at the sharpest they had ever been at x1525. All other tests showed the mirror's figure had tightened up further.

21-05-95 Sunday - 1 hour 35 minutes polishing as above with a concentration of the 'spring-like' strokes between the centre and edge. Testing showed all trends to be positive.

22-05-95 Monday - 1 hour 7 minutes polishing as above. Testing showed trend still continuing.

23-05-95 Tuesday - not well enough to do anything today.

24-05-95 Wednesday - 1 hour 18 minutes polishing as above. Testing showed the slight fault in the figure of the mirror still persisting yet the image forming qualities of the mirror as having improved they now crystal sharp at x740 and almost so at x1525.

25-05-95 Thursday - not well enough to do anything today.

26-05-95 Friday - 1 hour 48 minutes polishing as above. Testing showed no real or apparent change to be discernable. At this point I made a 6.3 inch tool from thick cardboard giving h.c.f. on one side feeling the 3 inch polier had reached the point of maximum usefulness. (total time on 3rd polishing attempt 172 hours 55 minutes to this point).

27-05-95 Saturday - 56 minutes polishing using the 6.3 inch tool using machine oil. I smeared on the surface of the mirror and a spring-like stroke trying for the most part to avoid the edge of the mirror (which was (as with the 3 inch tool) face up) and allowing the 6.3 inch tool to overlap the centre of the mirror in it's action. Testing showed further improvement or at least

no indications that the actions were injurious.

28-05-95 to 1

01-06-95 not well enough to do any more work on mirror.

02-06-95 friday - Made wooden box for 20 inch mirror today.

03-06-95 saturday - 2 hours 28 minutes polishing as above with the 6.5 inch tool using the machine oil and cerium oxide water combination. Testing showed changes to have slowed once again but still on the plus side.

04-06-95 sunday - not well enough to do anything today.

05-06-95 monday - 3 hours 33 minutes polishing as above. Testing showed a very minor gain with images achieving their maximum ever clarity.

06-06-95 to

08-06-95 too ill to continue with work on the mirror.

09-06-95 friday - I made an 8 inch tool doing 25 minutes polishing as above (total time 181 hours 15 minutes) before reverting to the 6.5 inch tool doing 48 minutes polishing as above expanding the 'coil' stroke to correspond to the stroke of the 8 inch above (total time then 182 hours 3 minutes). I did a further 29 minutes polishing as above using the 8 inch tool. (total polishing time then 182 hours 32 minutes). Testing showed further gains albeit small !.

10-06-95 saturday - not well enough to do anything today.

11-06-95 sunday - 3 hours 24 minutes polishing as above with the 8 inch tool. Testing showed changes continuing in the correct direction.

12-06-95 monday - 4 hours 31 minutes polishing as above. Testing showed a very slight gain. (total polishing time to this point 190 hours 27 minutes).

13-06-95 tuesday - 59 minutes polishing using the 6.5 inch tool using machine oil water & cerium oxide in a spring like stroke (with the mirror face up) but this time very much restricted (so as to avoid increasing wear at the mirror's centre and on it's edge (to a far greater extent than previously)). Testing 'suggested' further gains.

14-06-95 wednesday - 31 minutes polishing as above with the 6.5 inch tool this time leaving out the machine oil in order to accelerate wear on the irregular zonal error. Testing showed a 'slight' improvement. At this point I was relieved to find that absence of the machine oil caused no damage !.

15-06-95 to 1

19-06-95 work interrupted by a severe flare up in my medical condition.

20-06-95 tuesday - 1 hour 14 minutes polishing using above stroke with the 6.5 inch tool using a mixture of machine oil cerium oxide and water. Testing showed all zonal errors were now in the process of disappearing !.

21-06-95 to 1

26-06-95 work interrupted by a second flare up in my medical condition necessitating hospitalisation.

27-06-95 tuesday - 1 hour 28 minutes polishing as above. Testing showed no obvious gain. (The 3rd attempt polishing time to this point was 194 hours 59 minutes).

28-06-95 wednesday - I made a 3.75 inch tool of cardboard and h.c.f. having glued the one on the other.

29-06-95 to 1

01-07-95 too ill again to continue with work on the figuring of the 20 inch mirror.

02-07-95 sunday - 2 hours 15 minutes polishing as above using the 3.75 inch tool which effectively reduced wear at the centre and edge regions of the mirror. Testing showed the 'surface defect' in the process of going at last !. The images were now the sharpest I had ever seen the mirror form since I had begun work on it. In my carelessness and inattention as I was about to put the mirror back in it's box I bumped the optical surface against the corner of the bottom of my desk. On inspection I found a small 'v-shaped' scratch that I owe to my idiosyncy !. I had had no scratches to this point in time an issue of some pride with me till then. I did a further 2 hours 4 minutes polishing as above late the same night. Testing showed the 'ghosts' of the old faults still remaining though lessening slightly and the mirror than exactly the required depth - I could see small detail down to the limits of my own eyesight even using the x1525 magnification eye piece ie. the highest power I had. The failure of the final errors to work their way out puzzled me.

03-07-95 monday - 2 hours 25 minutes polishing as above. Testing showed little or no gain.

04-07-95 tuesday - Purchased the most powerful 'torch' I could get my hands on and conducted the 'wick' test on the mirror. Light too strong to perform the normal tests due to the strain on my eyes but it did indicate that my mirror still fell short of the final standards as judged by this last test.

05-07-95 wednesday - 1 hour 8 minutes polishing as above leaving out the oil in the hope of speeding up the removal of the 'ripples' on the mirror's surface. Testing showed the mirror had made slight gains it now showing signs that it might eventually make the final test hurdle. I did a further 2 hours 14 minutes as above in late afternoon. Testing showed continued gains though this appeared slight ?.

06-07-95 thursday - not well enough to do anything today.

07-07-95 friday - 47 minutes polishing as above. Too late in the night to test the mirror.

08-07-95 saturday - 23 minutes polishing as above. Testing showed further improvement to the mirror's figure. This now almost giving a 'pass' on the most difficult test Bob Berry had been able to invent !. I was quite overjoyed to see this it now being touch-and-go to final completion for what had been a very lengthy project.

09-07-95 sunday - 43 minutes polishing as above. Testing this time filled me with despair as the mirror's figure had once again slipped back. This appeared to me to be without reason. As judged by this 'final test' whilst before it was on the verge of a pass it now certainly was failing the test. I did a further 1 hour 34 minutes polishing (expanding the 'coil-stroke' suspecting this before in order to try to correct what I'd managed to undo and to further move in the right direction ie. to lessen action at the centre of the mirror. Testing showed that the damage had now mostly been undone. I did a further 2 hours 21 minutes polishing duplicating the above actions. Testing indicated that the mirror had made a return to its equal best previous state.

11-07-95 tuesday - 1 hour 26 minutes polishing such as above but narrowing down the zone of contact hoping to remove what remained of the surface ripple. Testing showed a very slight improvement in the mirror's figure.

12-07-95 wednesday - 42 minutes polishing as above using a smaller 'circle of contact' suspecting previous efforts fell slightly outside the area of the surface ripple ? Testing showed my conclusion correct - error now smaller than before !.

13-07-95 thursday - 1 hour 2 minutes polishing as above. Testing showed a further small gain.

16-07-95 sunday - 1 hour 1 minutes polishing as above. Testing showed another gain.

17-07-95 monday - 1 hour 39 minutes polishing as above. Testing showed yet another small gain.

18-07-95 tuesday - 1 hour 4 minutes polishing as above. Testing showed trend continuing.

19-07-95 wednesday - 1 hour 15 minutes polishing as above. Testing showed the same as above. I got the view that continuing as I had done recently with the above tool and actions would finally flatten the surface very slowly being that I might overshoot the mark ?. The images formed with the 81525 power now appeared crystal sharp and the best I had ever seen by far ?. Using this as a test would now appear effectively pointless the gains being limited even to this point.

20-07-95 thursday - 58 minutes polishing as above. Testing showed only the slightest trace of the zonal fault the trend continuing to be positive.

21-07-95 friday - not well enough to do anything today.

22-07-95 saturday - 1 hour 1 minutes polishing as above. I then reverted to the 6.5 inch tool doing 7 minutes polishing as above. In testing I found it hard to detect the existing surface errors; this making it difficult to plan any further attack on the mirror ?.

23-07-95 sunday - 32 minutes polishing using the 3.75 inch tool as above. I then did 5 minutes polishing using the 6.5 inch tool as above. Testing showed a further slight gain - now next to impossible to find the surface defects. I phoned Bob Berry at this point he coming over to the house to test the mirror himself; he thinking the only remaining problem being to smooth the surface out the mirror being of the right depth; he suggesting using a multiple-W stroke (with the 6.5 inch tool) bunching up the strokes near the left & right extremity i.e. sweeping more quickly over the central regions - I doing this for 6 minutes before we re-tested the mirror. No discernable change was found at this point indicating that at least this would need to be done in some what larger time frames. He thought also that this action could be interspersed with the rose-stroke ?. At this point I had run out of cerium oxide so could not immediately proceed further with this line of experimentation.

24-07-95 monday - new cerium oxide arrived in the morning. I did 25 minutes polishing with the 3.75 inch tool then 10 minutes polishing with the 6.5 inch tool. I then repeated the above two tool usages for 19 minutes & 6 minutes respectively. Testing showed a slight improvement.

25-07-95 tuesday - 20 minutes polishing using the 3.75 inch tool as above followed by 11 minutes polishing using the 6.5 inch tool also as above. Testing showed a further slight gain.

26-07-95 wednesday - 23 minutes polishing using the 6.5 inch tool using a wide spiral stroke. Testing showed negligible gain. This suggested that the above would prove too slow ?.

27-07-95 thursday - 28 minutes polishing as above but using the 8 inch tool. Testing showed a very slight gain in figure quality.

28-07-95 friday - 25 minutes polishing as above with the 8 inch tool. Testing indicated little if any gain. 27 minutes polishing using the 3.75 inch tool as previously used followed then by 10 minutes polishing using the 6.5 inch tool also using the previous type of stroke as above. Testing showed a further gain. At this point I guessed that the action performed with the smallest of the 3 tools was at this point getting the best results but that the progress was glacial. 1 hour 5 minutes polishing as above using the 3.75 inch tool followed by 7 minutes polishing as above with the 6.5 inch tool. Testing showed a

further small gain seeming to confirm my speculation.

29-07-95 saturday - 29 minutes polishing with the 3.75 inch tool as above followed by 12 minutes polishing with the 6.5 inch tool as above. Testing showed the mirror now just able to pass the 'wick' test.

30-07-95 sunday - 18 minutes polishing using the 3.75 inch tool as above followed by 16 minutes polishing using the 6.5 tool as above. Testing showed no apparent gain. Once again I concluded that the 3.75 inch tool might be battling against the 6.5 inch tool in some way and that I would be better off just to use the 3.75 inch tool on it's own ?. 30 minutes polishing using the 3.75 inch tool as above. Testing showed some gain at this point. Mirror now able to just pass the 'wick' test with the highest power (1525) which I had here. While some indication of faults remained I felt at a loss as to how to make any real headway at this point. Trying to smooth the mirror's surface seemed in practical terms now some what of an unreal thing since I might be unable in all probability to check for any gain ?.

31-07-95 monday - not well enough to do anything today.

01-08-95 tuesday - bob berry came over to the house and tested the mirror; his reaction being I had only two options open to me (1) the W-stroke - the option he favoured - & (2) the currently used stroke. I decided on the latter and put in 50 minutes polishing with the 3.75 inch tool as above. We then tested the mirror again. We saw no really noticeable change at this point.

02-08-95 wednesday - not well enough to do anything today.

03-08-95 thursday - 34 minutes polishing with the 3.75 inch tool as above. Testing showed little or no gain. 37 minutes polishing as above. Testing showed again little or no gain. 30 minutes polishing as above. Testing outcome once again as above.

04-08-95 friday - 56 minutes polishing as above. Testing showed a slight gain. I did a further 30 minutes polishing as above. Testing showed a very slight gain - the greater of previous faults still remaining - now so slight that risks have mounted out of all proportion to any possible benefit that I might get which suggested to me that I should now count the mirror as COMPLETE. (total time on 3rd polishing attempt 232 hours 37 minutes). (total time 318 hours 02 minutes).

POSTCARD FROM WILLIAM SHARP

Dear RR,

I need money to purchase medical text to research own medical condition, so if possible please print my ad.

I'm selling a pair of The Sharper Image micro-binoculars for \$38.95 (shipping included). Official Russian issue (KGB?), 25 power X 17mm. Original case & carton. Write Wm J Sharp, 7621 Eads Ave #2F, La Jolla CA 92037-4822.

[Editor's note—Richard May sent this to me a long time ago with a note reading, "Thought you might be amused. Professor Phillips is a friend of a friend, with whom I've exchanged letters." Since there's room in this issue, here it is. I should be concerned about offending, but I'd rather fill pages.]

ALL ABOUT MERKINS

Roger W. Phillips

1. LEXICOLOGY

Few words in the sexual vocabulary beyond the most basic have had such a variety of meanings and applications over the centuries as *merkin*. Today the chief definition of *merkin* is that of imitation pubic hair for women, although in earlier British times, when a variant spelling was *mirkin*, it referred to the pudendum itself and the natural hair that garnished it. The present usage crops up in the early 17th century, and by 1796 and the third edition of Francis Grose's *Classical Dictionary of the Vulgar Tongue* we have what amounts to today's denotation: "counterfeit hair for women's privy parts." The current edition of *Oxford English Dictionary* cites this; *Webster's New International* (third edition) gives "false hair for the female genitalia." Richard A. Spears in *Slang and Euphemism* (1981) calls it "false female pubic hair" after giving the above-noted obsolete meanings, but is rather far off the mark in placing this as "British, late 1700s-1800s," since, as shown by the quotations below, this sense was clearly established by the time of Shakespeare's death.

Numerous other meanings of the word are in evidence. Charles James's *New and Enlarged Military Dictionary* of 1802 defines *merkin* as "a mop to clean cannon." Among the meanings given in Farmer and Henley, *Slang and Its Analogues*, are that of "fur" in general and, as thieves' cant, "hair dye," the latter also noted in Eric Partridge's *Dictionary of Underworld Slang* (1961). In various editions of his *Dictionary*

of *Slang and Unconventional English* (the latest of which appeared just last year), Partridge defines it as "an artificial vagina for lonely men"; this sense also appears in the most recent *OED* supplement.

The etymology of *merkin* is more than a little uncertain, but *OED* considers it an apparent variant of *malikin*, which was originally a diminutive for the name *Maud* and is dialectal for a number of things: "untidy woman, slattern"; "a pole with a bundle of rags attached for cleaning out ovens"; "scarecrow"; "cat"; "hare." It can be seen easily enough that not all the senses of the two words jibe.

As pubic wigs, merkins were later also called *bansers*. The etymology here is also uncertain, although it might be conjectured that the word in this sense (while related in others to *booze*) is an offshoot of *bursar* (treasurer), which is derived from Latin *bursa*, lit. "purse," "a bodily pouch or sac," whence the connection with the female genitalia.

2. SOME INSTANCES OF USAGE FROM EARLIER LITERATURE

John Taylor, known as the "Water Poet" (1578-1653), employs the word in his *Trauels in Bohemia* (ca. 1617; collected works 1630), in iambic pentameter lines apropos of an enormous wine vat he had seen in Prague: *Or had Cornelius but this Tub to drench / His clients that had practis'd too much French / A thousand hogsheds then would haunt his Firkin / And Mistris Minks recover her lost Merkin*. A partial loose translation: there's enough wine in such a tub to put the hair back on a woman's pussy.

In a 1660 periodical, *Mercurius Fungus*, appeared a notice that a merkin had been lost in Covent Garden.

John Wilmot, second Earl of Rochester (1647-80), in a letter apropos of his play *Sodom, or the Quintessence of Debauchery*, says that some people might as well "wear some stinking Merkin for a beard."

In *The History of the Lives of the Most Famous Highwaymen* (1714), Alexander Smith describes how one such rascal obtained a merkin, dried and combed it out well, and then presented it to a cardinal as St. Peter's beard.

Bishop Thomas Percy's *Reliques of Ancient English Poetry* (1765) includes some bawdy songs and ballads, among them one from ca. 1620 "wishing good health to all Ladies that never used a Merkin." This is a little ironic since a woman wouldn't have needed to use one if she had been healthy in the first place. See the notes below.

3. GENERAL HISTORICAL NOTES

Merkins were in fairly common use in the 17th and 18th centuries due to loss of hair from the frequent smallpox epidemics. Naturally, the fashion fell off rather sharply after the introduction of vaccination. But there had been earlier precedents for the cosmetic attention paid to that area of the female body, as well as later manifestations. In 16th-century France it was considered an elegant thing for aristocratic ladies to pomade their pubic hair and adorn it with colorful bows and ribbons, while letting it grow as long as possible. Such fashions come and go: witness the recent fad for shaving the pubes altogether (if we can believe what's reflected in the proliferation of skin mags on this theme!), or, especially in the late 60s, cutting it into various symbolic forms, e.g. the heart shape.

The word under discussion has never been particularly well known or understood by the general public. This situation is interestingly underscored, I think, by its sly usage in proper names in a couple of British films that appeared within the last twenty years. In *Dr. Strangelove, or How I Learned How to Stop Worrying and Love the Bomb* (1964), the President of the United States, played by Peter Sellers, is Merkin Muffley. Then there's a 1969 bit of fluff directed by Anthony Newley and boasting the likes of Milton Berle,

George Jessel and Joan Collins, entitled *Can Hieronymus Merkin Ever Forget Mercy Humppa and Find True Happiness?* But the last laugh here is that there really are people in the world named Merkin, and more than a few. You'll find seven in the current London phone book, as well as five in Chicago and over forty in New York!

[Editor's comment—In Noesis 106, I said send anything—lint, lima beans, your gas bill—and I'd publish it. Celia Manolesco did exactly that.]

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