Sept. 1951

Signer N.A., ~~the~~ bundle of fibres, selected dangled over sat. $KClO_3$ & straightened - slightly extended.

Micro-camera. Fluorescent screen. No filter

1. 1st small specimen, over $KClO_3$ 2 hrs 10 mn

2. New specimen 10 mn
Pack v. wet, drop of water in camera

3. Same, dried, over sat. $KClO_3$

4. Stretched ~ 50% of its length, over $KClO_3$

5. Same specimen, over sat. NH_4Cl, 15 mn
19.9.51 3 p.m. in camera, H_2 flow started. Sat. NH_4Cl in camera
New filament
20.9.51 Exposure 2.15 - 5.45

80%.

6. 20.9.51 6.30 p.m. Same specimen in camera, ~~over~~ Na_2CO_3 – camera 2 – H_2 flow
22.9.51 exposure 3½ hours
~~23.9.51 Exposure 10.15~~ 92%

7. As 6. 21.9.51 6 p.m. H_2 flow, Na_2CO_3
~~24.9.51~~ Exposed 5 hrs
specimen ~~un-stuck~~ ~~0%~~

~~7~~ ~~25.9.51 12 p.m. $NaNO_2$ equil. @ 78%~~
~~24.9.51 5 p.m. H_2 flow, Na_2CO_3~~
26.9.51 Exposed 3 hrs (3–6 p.m.)

~~8 26.9.51 5 p.m. over $NH_4Cl + KNO_3$~~

~~Na_2CO_3 92%~~

8. 27.9.51
5 p.m. over sat $CaNO_3$ → equil @ ~~51~~ 49%
5.30 – 6.00 (49–53%)
1.10.51 11.30 – 5.00
(6 hrs)

9. Specimen built up from ~ 30–35 Silver fibres, stuck together by keeping wet.

1.10.51 6 p.m. over H_2, sat NH_4Cl
2.10.51 10.15 – 12.30

10. 2.10.51 over Na_2CO_3 (92%)
1 hr to equilibrate, 4 hrs exposure
– sample moved: too wet

10.10.51

Single fibre of Seguer DNA, fairly thick, ~~which~~ part selected as giving better extinction than most thick fibres. though not perfect

Micro camera

100μ collimator (fibre diameter ~ $\frac{1}{4}$ collimator diameter)

Ni filter

Specimen stretched over collimator using holder, the other set glued to collimator on other side of hole

0.26 n.a. 36–38 KV

2 p.m. H_2 through sat. NH_4Cl through camera, sat. NH_4Cl in camera

3.45 p.m. tube on

12.10.51

11 a.m.

NH_4Cl sol^n found in camera (specimen unharmed)

Fibres developed ⊥ no good

(10) A B & C

12.10.51
Same specimen & cond^n, repeat
2 p.m. camera set up as H_2 & NH_4Cl sat.
8 p.m. tube on (Filament 6 hrs)
13.10.51 4 p.m. Filament burnt out
15.10.51 11.30 a.m. tube on (New Filament)
Filament burnt out during night of 16-17, & Tank developed
17.10.51 Leak in window patch w plasticine
Target cleaned, new filament
→ much brighter beam (as bright w Ni as previously without)
5 p.m. tube on
18.10.51 Same again during night
Tube cleaned, new filament 4 p.m.
19.10.51 Stopped for 6 hrs & renew brass can
20.10.51 H_2 stopper blown off during night. Stopped 7 hrs
21.10.51 ✓
22.10.51 Filament burned out during night.
Removed & target cleaned. Started 2 p.m.
23.10.51 2 p.m. ff - developed

25 hrs
31-43
?
2-15
53-77
24

Total exposure 135 — 184 hours

Filament life ~ 6 hrs

23.10.51 Yougoslav carbon ③ 2.30 – 5.30

(11) β Coli 6 p.m. (NH_4Cl, filter)

24.10.51 12 p.m. stopped (18 hrs)

(12) 24.10.51 4 p.m. embryo rat tail collagen

H_2 through sat. $Ca(NO_3)_2$, not in camera

exposed 1 hr

25.10.51 10.30 – 1.00

3.30 – 10.00 } 10 hrs

3 films, thick gelatin ∴ distance ~ 1

Equatorial are 3.8 mm

$\tan 2\theta = \frac{1.9}{13.5} = .14$ $\theta = 4° 0'$

$d = 11.0$ Å

Diffuse ring 8 to 13 mm

$\tan 2\theta = .30$ to $.48$ $\theta = 8° 21'$ to $12° 48'$

$d = 5.3$ to 3.5 Å

Meridional arc 17 mm

$\tan 2\theta = .63$ $\theta = 16° 6'$

$d = 2.8$ Å

30.10.57

Pin-hole photographs on Ehrenberg tube

Pinhole size - 5 divisions on micrometer scale
$= \frac{5}{80} = .0625$ mm

Distance pin-hole → tube faces ~ 1.15" = 29 mm

Distance " → film 12", 20" and 29"
i.e. 305, 510 and 740 mm

Size of image. @ 29" 1.5 → 2.3 mm × 3[illegible] → 5.5 mm
@ 20" 1.0 → 1.6 mm × 2.3 → 3.7 mm

∴ penumbra @ 29" $\frac{0.8}{2} \times \frac{2.3}{2} = 0.4 \times$ [illegible] mm

" " 20" $\frac{0.6}{2} \times \frac{1.4}{2} = 0.3 \times 0.7$ mm

∴ focal size (given by 29" image) $= \frac{1.15}{29} \times 0.4 \times \frac{1.15}{29} \times$ [illegible]
$= .016 \times$ [illegible] mm

Beaudouin filament field

~~coll~~ int. dia. 15.55 mm

~~length~~ 70 mm

(13)

2.11.51

Bundle of Sigrun fibres (prepared Sept. '51) in micro-camera on Beaudouin tube. Stretched to collimator rear hole on narrow 0.1 mm Al strips

Ni filter 2½ ma., 37 KV, bias

$NaClO_3$ sol^n, H_2 ℓ in camera

11.00 a.m. camera set up, H_2 over

11.45 tube on

5.45 Off } 6 hours

(13~~4~~) As above, with Na_2CO_3 sol^n (92%)

2.11.51 6.30 p.m. specimen in camera, H_2 flow

7 p.m. tube on

3.11.51 Filament burnt out during night

5.11.51 Transferred to Shrader tube

~~11.45~~ 11.45 tube on

Good beam, 2.4 amps through filament (tub. protrudes ~1 mm through hole)

5.45 Off

→ "wet" photo

Filament left 33-45 hrs

(15) As above

5.11.51 6.30 over H_2, No CO_3

6.11.57 4.00 – 9.45 } 10½ hrs

7.11.57 10.45 – 3.30 } → "crystalline"

(16) 7.11.51 4.00 over $Ca(NO_3)_2$, H_2

6.00 on

8.11.57 Switched off during night

on 11.30 – 3.00

→ "crystalline"

(17) As (16). 8.11.51 6.00 on 9.11.51 10.00 off

Specimen broken – no photo

(18) 9.11.57 Same specimen, pinned down with Al strips one end loose

10.30 over $CaCl_2$, H_2

11.45 – 3.00 (filament burned ~ 3 pm)

10.11.51 New filament

10.30 on (switched off some time between 12.30 & 1.30 & on again 1.30)

3.00 off

(19) As above

P_2O_5 in camera H_2 through 98% H_2SO_4

10.11.51 H_2 3.30 p.m.

12.11.51 10.45 on

6.00 off } 72 hrs

P_2O_5 in camera got v wet. film blackened probably ∴ acid vapour

(20) As above

~~H_2 through 98% H_2SO_4 over KOH and P_2O_5~~

P_2O_5 in camera

13.11.51 4 p.m. H_2 through camera

5.45 tube on off

Specimen moved } 22 hrs

14.11.51 4 p.m. — 15.11.51 12 noon

(21)

As above Na_2CO_3

15.11.51 12.45 in camera, H_2 "drug photo

5.30 on

16.11.51 9.30 off } 22 hrs

Filament 55 hrs in fact

(22)

As above 16.11.57 4.30 over Na_2CO_3 "dry" photo
6.30 on
17.11.57 2.00 off } 19½ hrs ✓ good resolution

(23) 17.11.57 6 p.m. over K_2ZnO_4 (99%) ~~25~~ wet
18.11.57 12.00 Specimen has visibly wetted
18.11.57 12.~~15~~ ~~55~~ camera over Na_2CO_3
12.55 on
19.11.57 11.15 off } 22½ hrs Hydrogen flow stopped during night
"dry" photo

(24) Specimen wetted by standing over K_2ZnO_4, then over Na_2CO_3 in camera 48 hours, then exposed 30 hrs

(25) French rots specimen A. Bundle of fibres straight from tube placed over 100μ collimator
26.11.57 3.30 in camera over $NaClO_3$
27.11.57 5.00 on
28.11.57 10.30 off } 17½ hrs Top film, fine grain
2nd film, monocoarse
(liquid got into camera at start)

19½
22½
30
17½
89½

Filament 145 hrs so far

DNA fibres suspended – alcohol – water – alkali mixtures

6.12.51 6 p.m. Bundle of fibres, as received (Signer non-swelling)

1. Wt bottle + suspended fibre 64.4 g
" " + alcohol 75.4 g
" " " + water 76.1 g
+ ~ 0.01 g KOH

8.12.51 + more water ~ 72.7 g
mainly dissolved
Ca little left clinging to nylon fibre

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2. Fibre bundle tied w fine Cu wire, suspended in ~ 70% alcohol
→ v highly swollen gel
added little alcohol (~ 5%)
– still v swollen gell
added ~ 0.03 g solid KOH (to ~ 18 cc liquid)
fibre bundle immediately shrinks & transparent gel becomes opaque
Shrunk to ~ ⅓ length (in ~ 10 mins)
Removed from liquid shown not to be still gelatinous
– left to stand – liquid

10.12.57 10 a.m.

K-specimen apparently unchanged. (Sol yellow, prob. ∴ evaporated from Cu wire)

Specimen removed, and gelatinous piece of length ≈ 3 mm stretched to fibre 30 – 70 μ, ~ 2 cm long

- stretching very easy and smooth → +ve fibre

∴ repeat

3. 3 g.m. bundle of fibres suspended in 10 cc 70% + 10 cc 80% alcohol.

3.35 Still opaque (but gelatinous). Transferred to 70% alcohol

5.30 Added 0.05 gm KOH

- specimen broke

4. Added fibre bundle, room dry, to KOH-alcohol-water used for 3. Shrinkage observed as in 2.

Pulled out to +ve fibre

N.B. These +ve fibres when smeared or when pulled to ± or ∓ fine fibres always remain +ve

11.12.57 Repeated above expts omitting KOH, to see if alcohol alone affects stretching properties → Gelatinous mass behaving as normal material. Not easy to pull to thick fibre as after KOH treatment, & not → +ve at any stage

Smeared to thin fibres + slats → always weakly −ve

13.12.51 Bundle of ~ 20-30 Sigma pulled fibres tied together with fine Cu wire & suspended in sat. KCl - H_2O - alcohol mixture 11 a.m.

- mixture made up to give extensive swelling

3.30 p.m. put to wash in 70% alcohol

Stretched & broke

Now specimen 20-30 fibres put in KCl - H_2O - alcohol ~5.30 p.m.

14.12.57 11 a.m. put to wash in 70% alcohol

5 p.m. dried over P_2O_5

17 ~~Dec~~.12.57 11 ~~30~~ a.m. in camera

(26) 6 fibres (+ve) of KOH-treated DNA in adapted Guinier camera (specimen over lead guard-hole on Hirst plate of new micro-camera) No filter. 75% humidity ($NaClO_3$)

12.12.57 7 p.m. on. 11 p.m. still on

13.12.57 10 a.m. off during night. Switched on 5 p.m. developed → black fibre

Repeat with slits more closed (weaker beam)

6 p.m. → 11 a.m. (14.12.57) (17 hrs)

(27) Bundle of KCl-treated Sigma fibres

17/~~Dec~~.57 11.30 in camera over H_2, sat $NaClO_3$ (75%) (adapted Guinier camera, specimen in brass plate with guard-hole)

12.00 On

~~4.15~~

20.12.51

Swelling of fibres.

Fibres of "non-pulling" Signer DNA, swelling observed under microscope

① Small fibre ~ 0·6 scale divisions (i.e. 8 μ) at narrowest bent oriented part
enclosed in 92% humidity (sat. Na_2CO_3)
Rapid swelling to ~ 2× diameter - well-oriented part rather less

② Fibre of unequal quality, finest oriented part ~ 8 μ,
Enclosed by water
Rapid swelling → ~ 2× diameter
then slow
after 2 hours, diameter increased ~ × 10 .
Length increase small (straight ~~stretched~~ fibre, with ends fixed,
→ only slightly wavy)

Small drops of condensed water visible everywhere except
immediately on either side of fibre (showing that even
for 10-fold linear swelling reduction of VP is appreciable)

11.12.51 → 28.12.57

2 attempts to photograph single fibres ~ 10 μ after baking over, one exposure 2 weeks, one 1 week
→ v poor intensity, mostly impurity and only dissolved DNA (used new "non-pulling" Signer specimen)

(28)

27.12.57 Single fibre ~~old~~ Signer DNA after 3 weeks over P_2O_5 (pulls v well) ~~0.01~~ 0.001" Al over ½ film 3 films
Baked over-night at > 50° (6 p.m. - 10 a.m.)

28.12.57 5 p.m. in camera, H_2, $NaClO_3$
6.00 tube on (new filament)

29.12.57 12 noon beam v weak

31.12.51 10 a.m. beam invisible. Developed
→ wet photograph
∴ specimen baked over overnight before wet photograph

(29) 67% RH 3 films
Poor resolution

(30) As (29) 68% RH 1 film
still poor resolution

(31) 7.1.52

~70% RH, new fibre ~ 40μ

Beam from tube, chromium target, no filter

on 7.30 p.m.

8.1.52 2.30 off. Blank film

- fibre moved: not stuck directly on collimator

(photo under-exposed, & resolution on equator v poor)

(32) 22.1.52

Bundle of ~10 fibres of Signer DNA 2

Micro-camera, No.

Specimen dried 3 hrs over P_2O_5. Then 2 days @ 76% RH

22.1.52 6 p.m. → 23.1.52 10 a.m.

wet diagram

(33) 24.1.52 6 p.m. → 25.1.52 10.30 a.m.

3 30-40μ fibres Signer DNA 2 ; Dried 50°

no filter, 73% RH

→ wet diagram (with badly fogged centre)

25.1.52 → 1.2.52 Series of photographs with Signer DNA 1 and 2, humidities 60 - 80%; always → "wet" photo

is this specimen ever heated in air? (40 - 60°C)

(34) as above, Signer 1, no filter, 65% RH

→ "wet" photo 1.2.52. 16 hrs

(35) New specimen dried room T over P_2O_5 v fibre 6 fibres

→ "wet" photo 2.2.52 16 hrs

(36) 3.2.52 4 30μ. fibres

New Signer DNA v fibre. 74% RH

3.2.52 2 p.m. → 5.2.52 11 a.m.

→ "wet" photo

(37) New filament

Bundle of Signer DNA 1 fibres (not really) wetted & stretched to ~2x length

$NaClO_3$ sat^n, nohygrometer; No filter

5.2.52 2.30 → 6.2.52 10 a.m.

→ "Xtalline" photo, v weak exposure & poor resolution

10.55 specimen on camera & over at 50°C till 2.30

~~38~~ Specimen as above, after 4½ hrs 2·50°. Ni filter

7.2.52 – 3.00 – 8.2.52, 3.00 – 24 hrs.

→ "crystalline", apparently better oriented Asbestos slightly better but still poor. Orientated ~ 80%.

In oven 3.30, exposed 3 days – fogged

38 ~6 Sigma 1 fibres // but converging

~½mm in depth from surface of collimator. Ni. $NiCl_3$

12.2.52 9.30 on

→ photo showing some well-oriented — strong amorphous ring. Specimen contained 1 fat +ve fibre – presumably +ve fibre gave amorphous ring

39 2 fibres Sigma ② ~20–30μ — 8 days

no filter, 75% RH

18.2.52 3 p.m. on. 19.2.52 10 a.m. off

→ "wet" type photo v thin diffuse spots on equator

40 4 Sigma ① fibres, 18–30μ. Dried 6 hrs over P_2O_5

Ni, 75% RH

20.2.52 5.30 → ? (take off during night; unsatisfactory pattern)

→ v weak xtalline, orientation apparently good, resolution doubtful

41 Same specimen, repeat w 3 films & smaller hole Ni

21.7.52 11.00 on

23.7.52 11.00 off } 48 hrs

→ v good, orient good, resol" moderate.

Repeat longer exposure

42 New filament (other not burned), clean target Ni. 3 films

23.2.52 1.00 on

26.2.52 off for 1 hr to clean target } 116 hrs

28.7.52 10.00 off

43

Same specimen, 92% RH

(test for 1 hr over 92% showed fibres don't move)

28.2.52 12.00 on.

29.2.52 2.30 a.m. off (Cl_4 off) } 14½ hrs

→ Xtalline

44 Same specimen but now only 3 fibres (fattest first)

29.2.52 5 p.m. on

10.30 p.m. filament burned out

1.3.52 12.30 p.m. on. 3.3.52 12 a.m. off

3.3.52 11 a.m. on