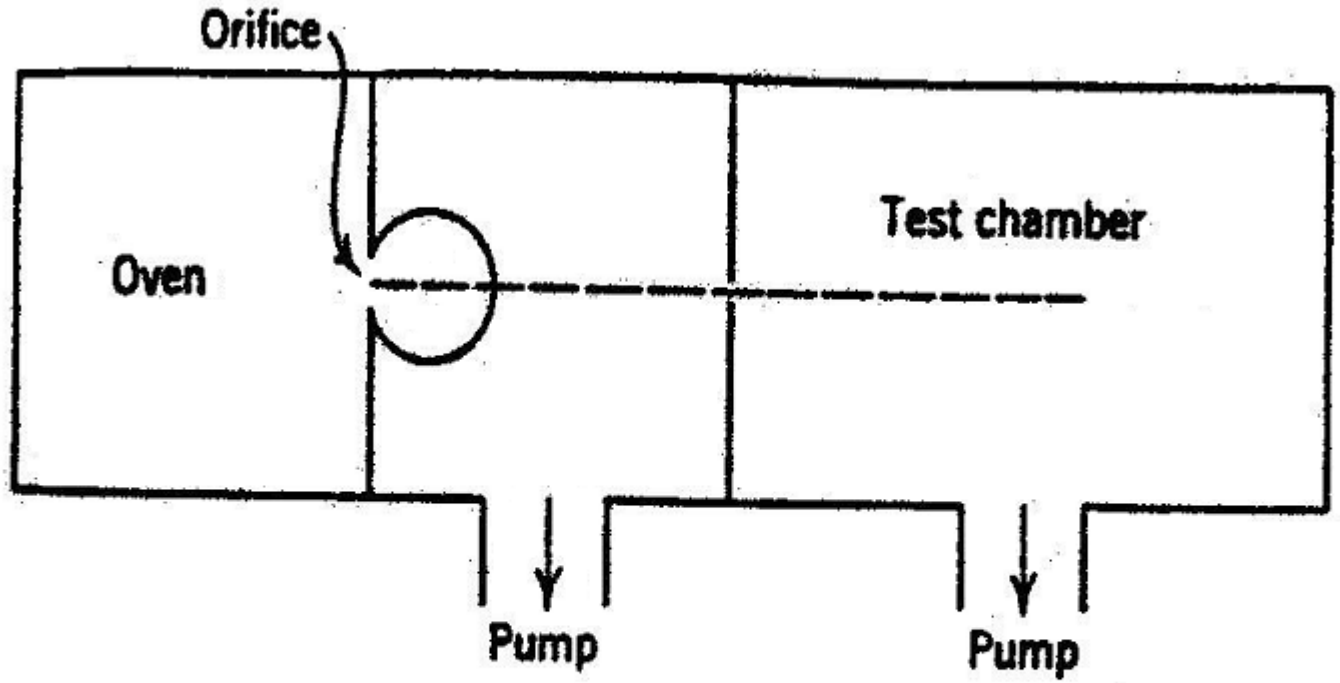
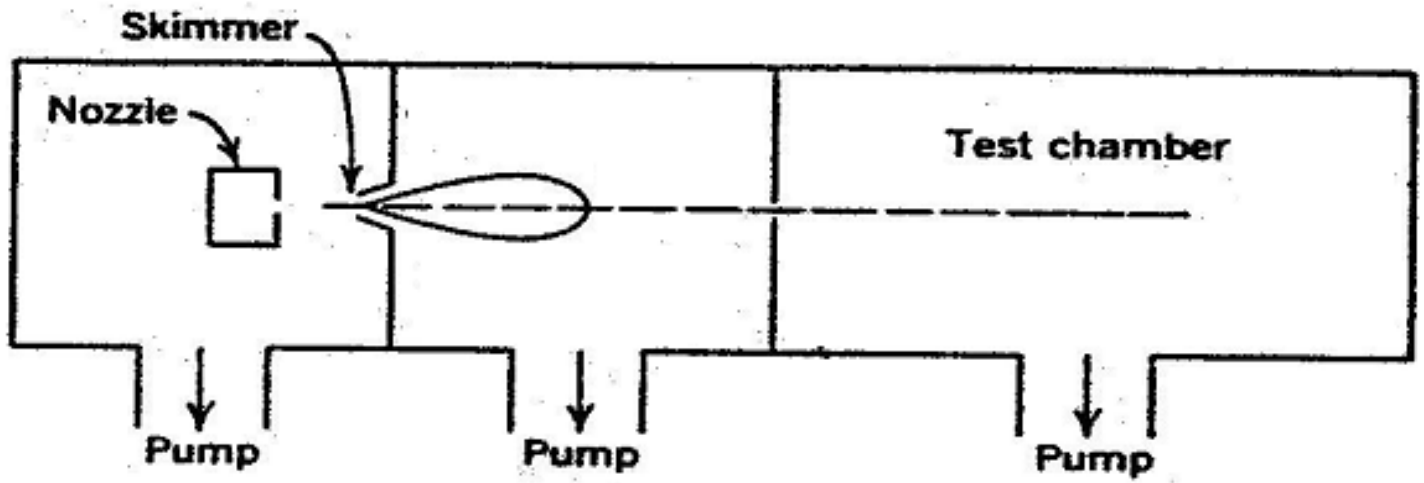
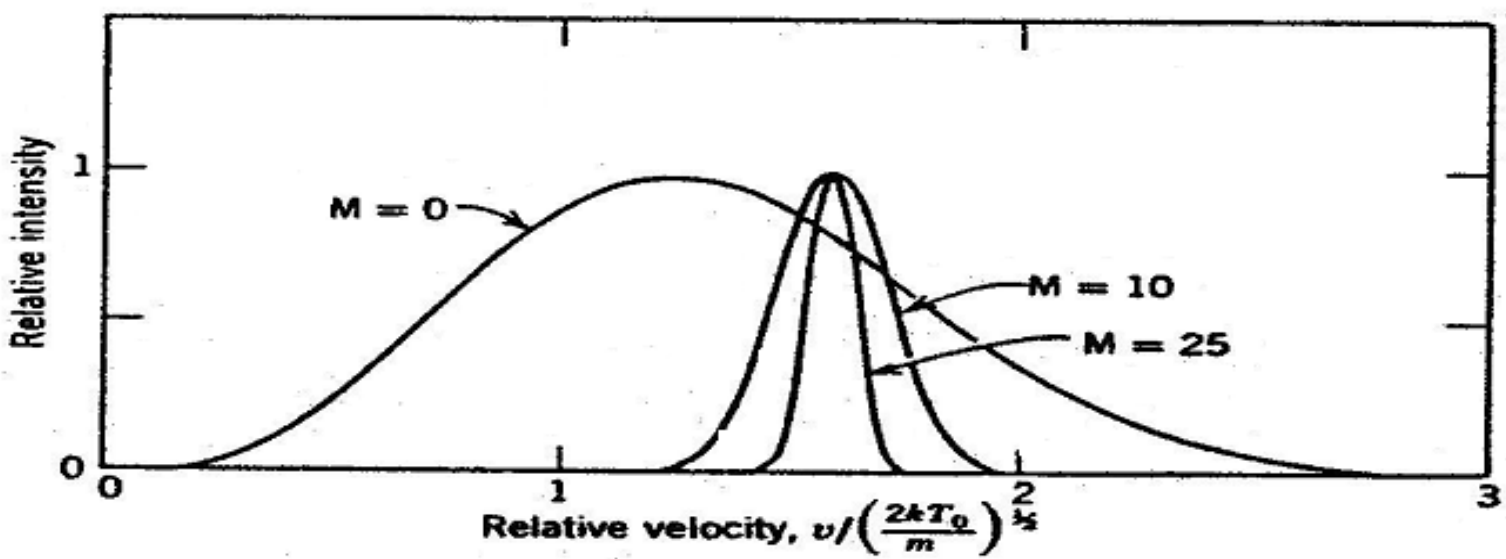
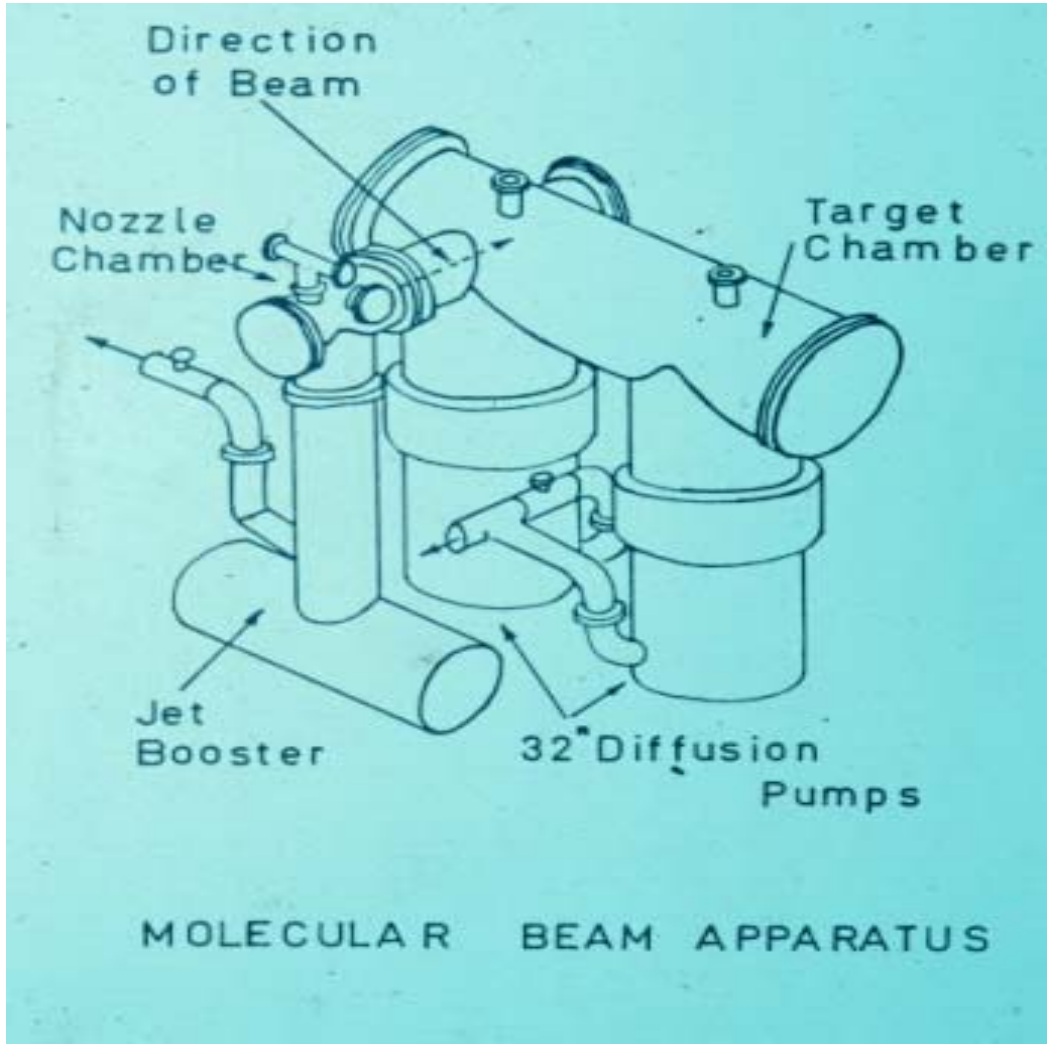
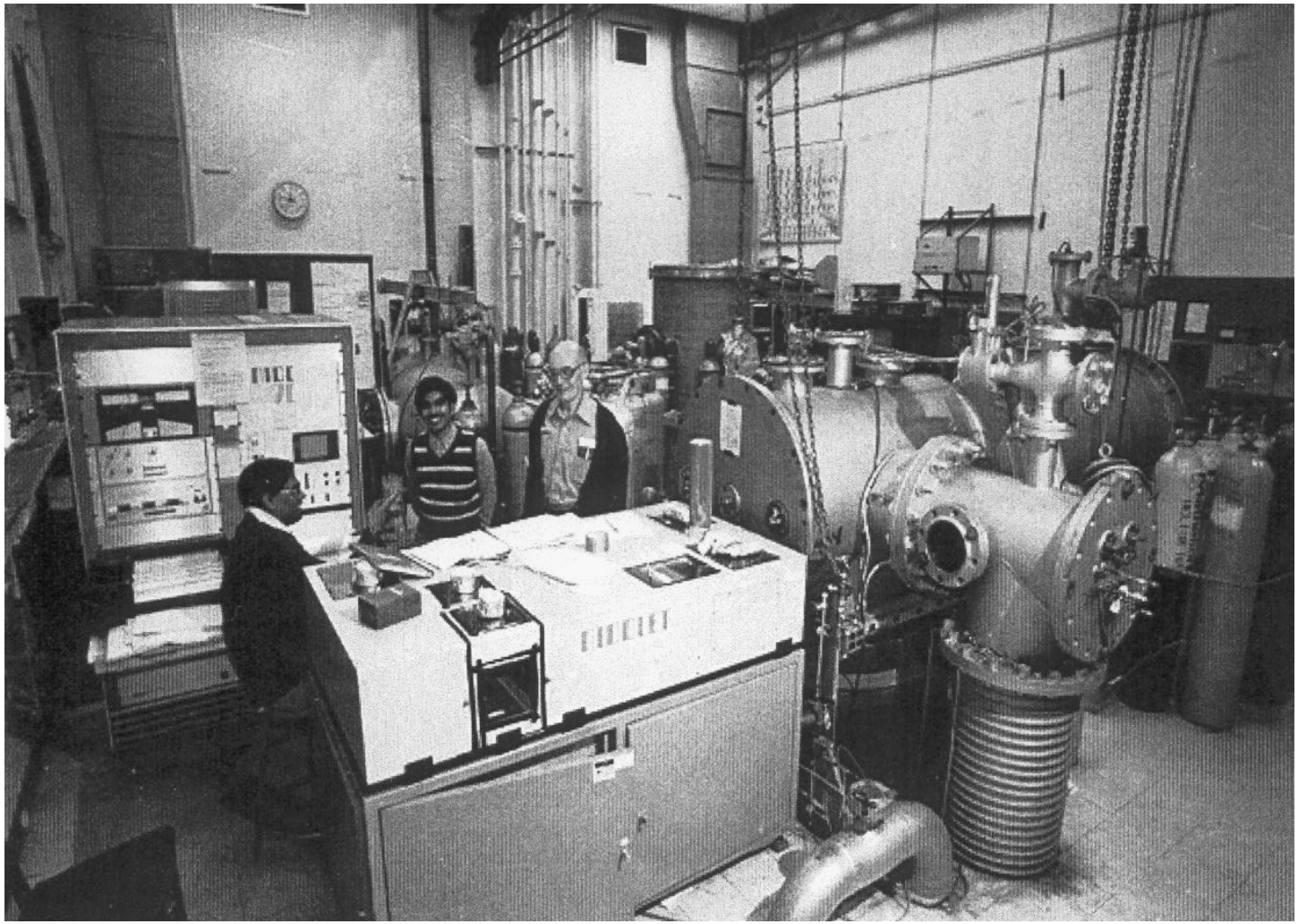


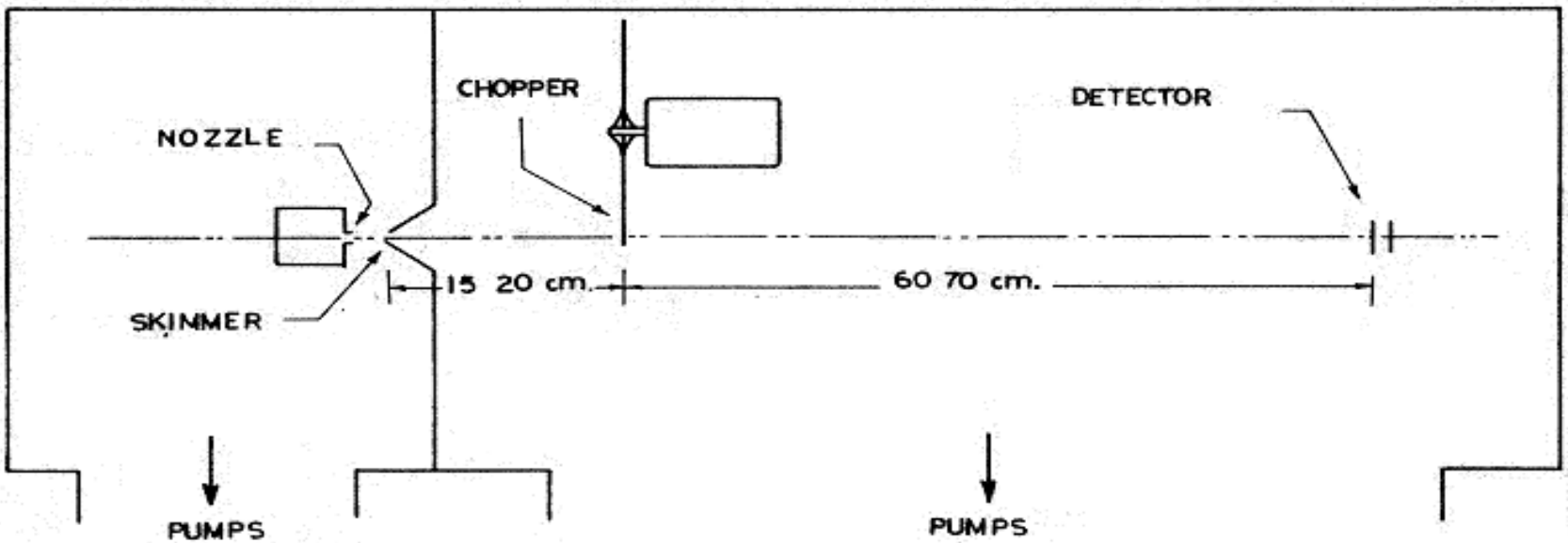
Conventional oven beam

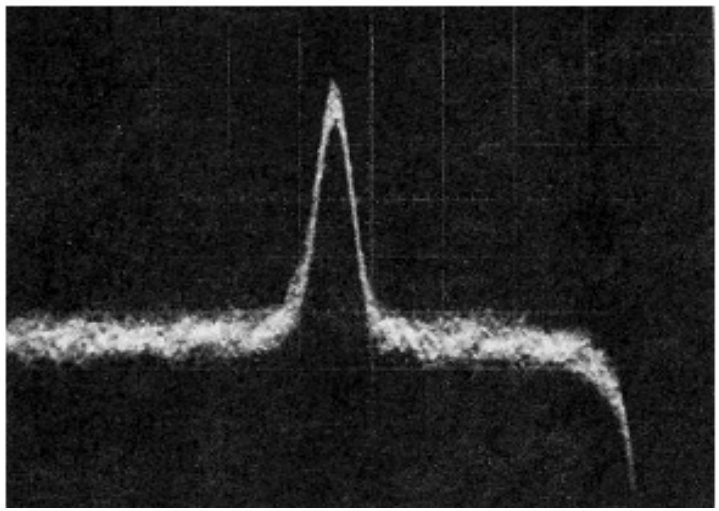

Skimmer
Nozzle
Test chamber
Pump
Pump
Pump

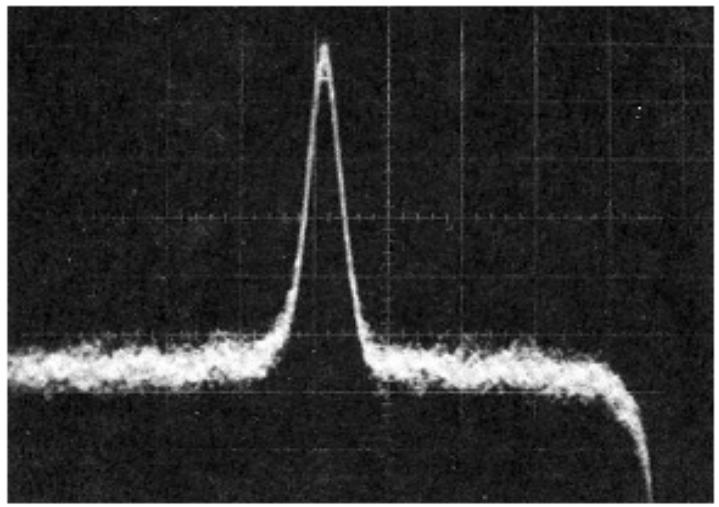

Relative intensity
1
0
M = 0
M = 10
M = 25
0
1
2
3
Relative velocity, $v/\left(\frac{2kT_0}{m}\right)^{1/2}$

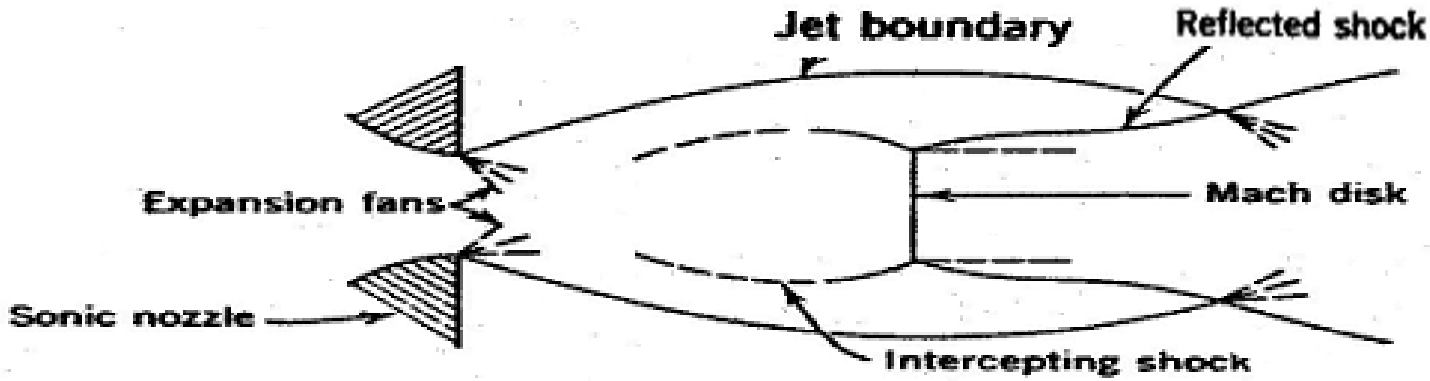

Direction
of Beam
Nozzle
Chamber
Target
Chamber
Jet
Booster
32" Diffusion
Pumps
MOLECULAR BEAM APPARATUS



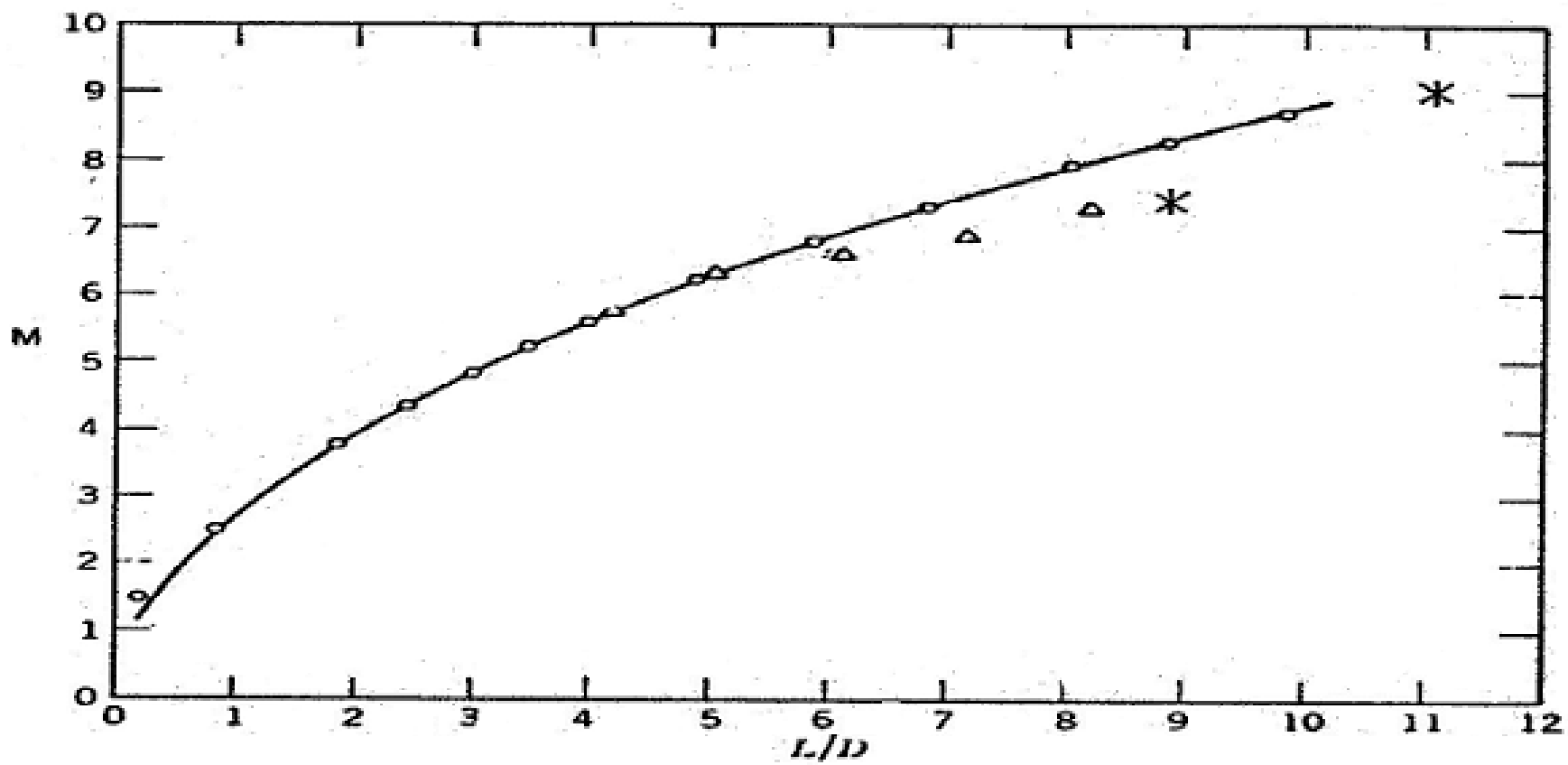

CHOPPER
DETECTOR
NOZZLE
SKIMMER
15 20 cm.
60 70 cm.
PUMPS
PUMPS



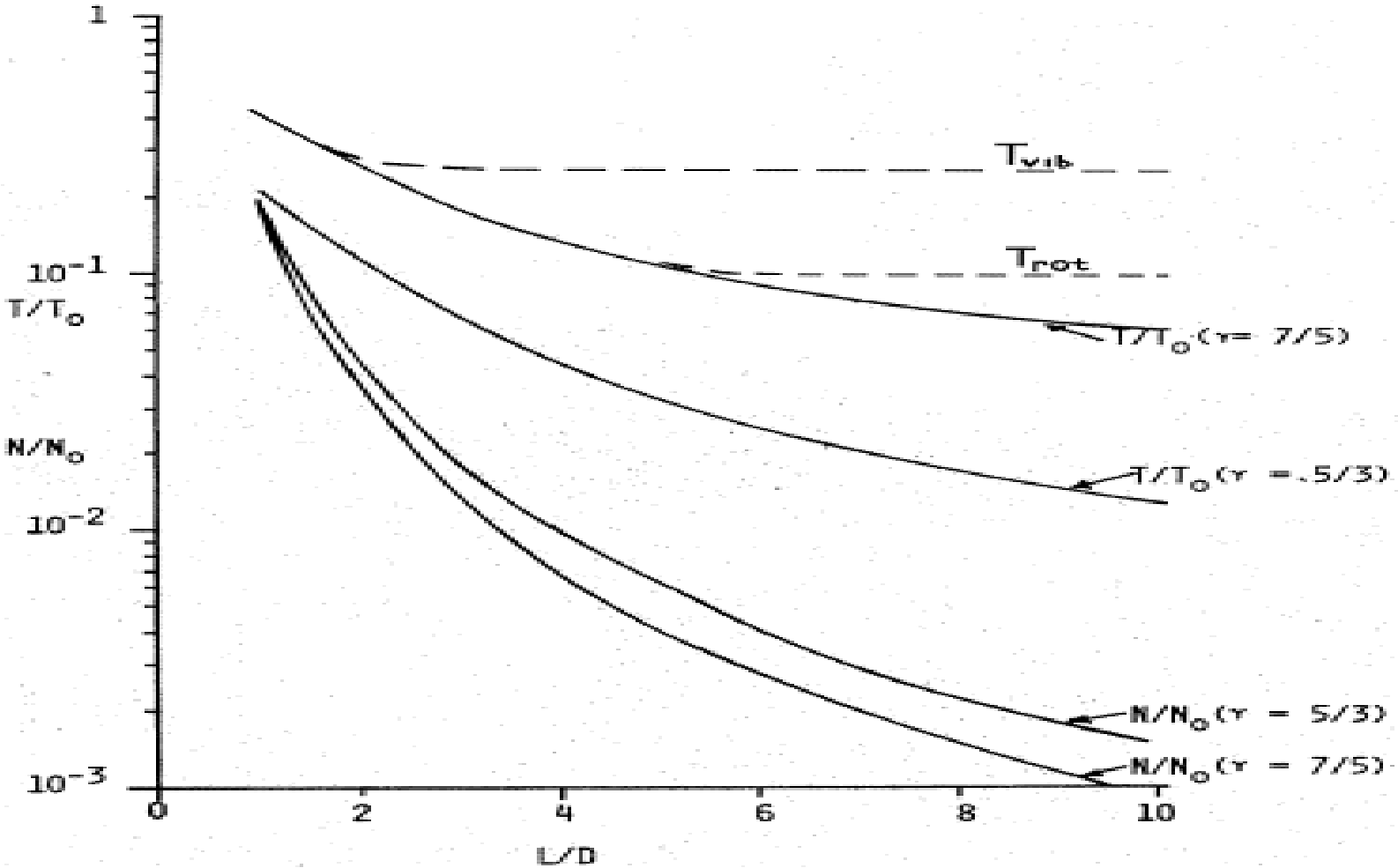


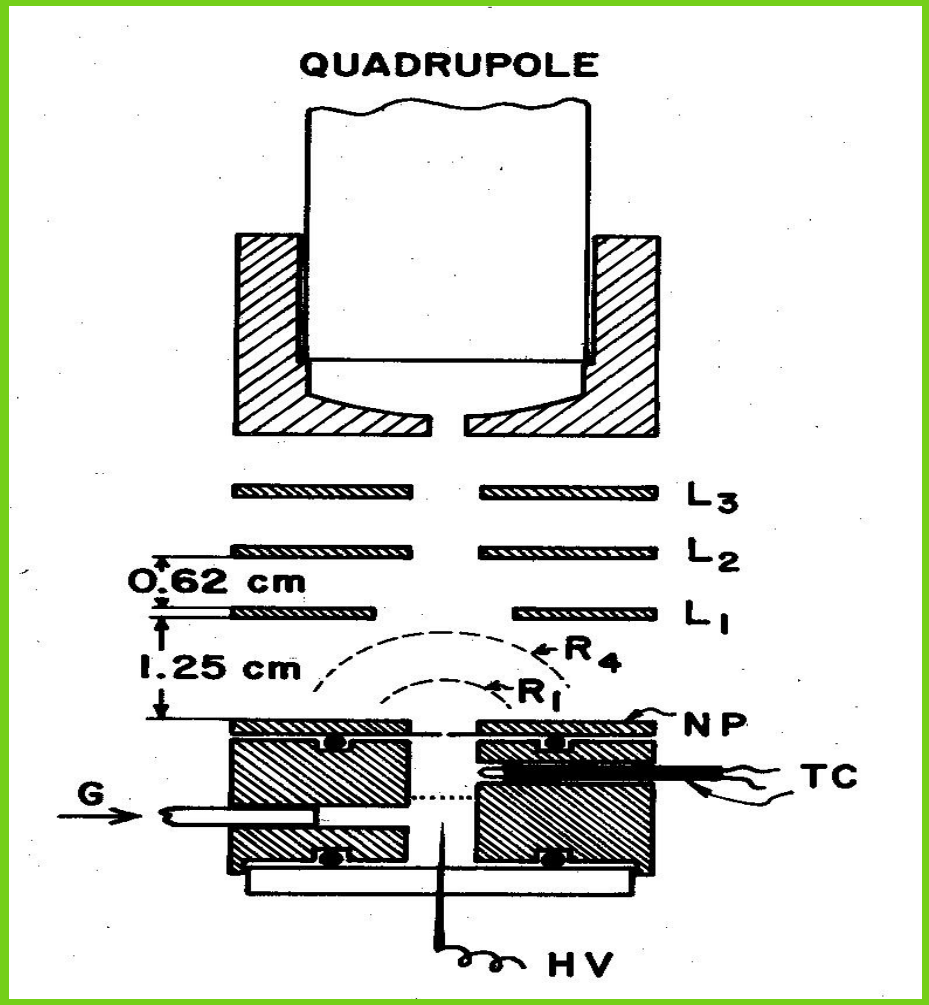


Underexpanded jet structure

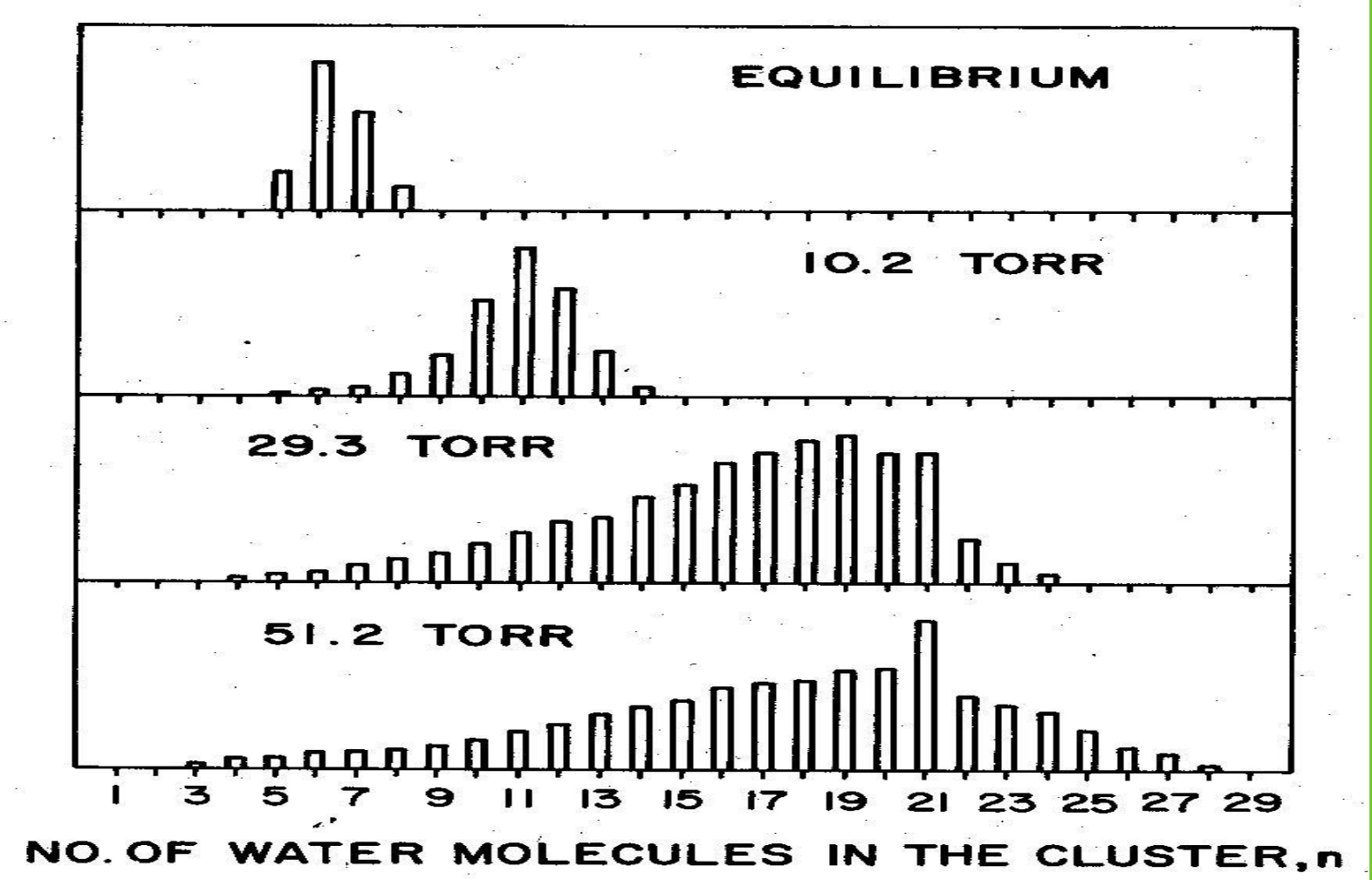


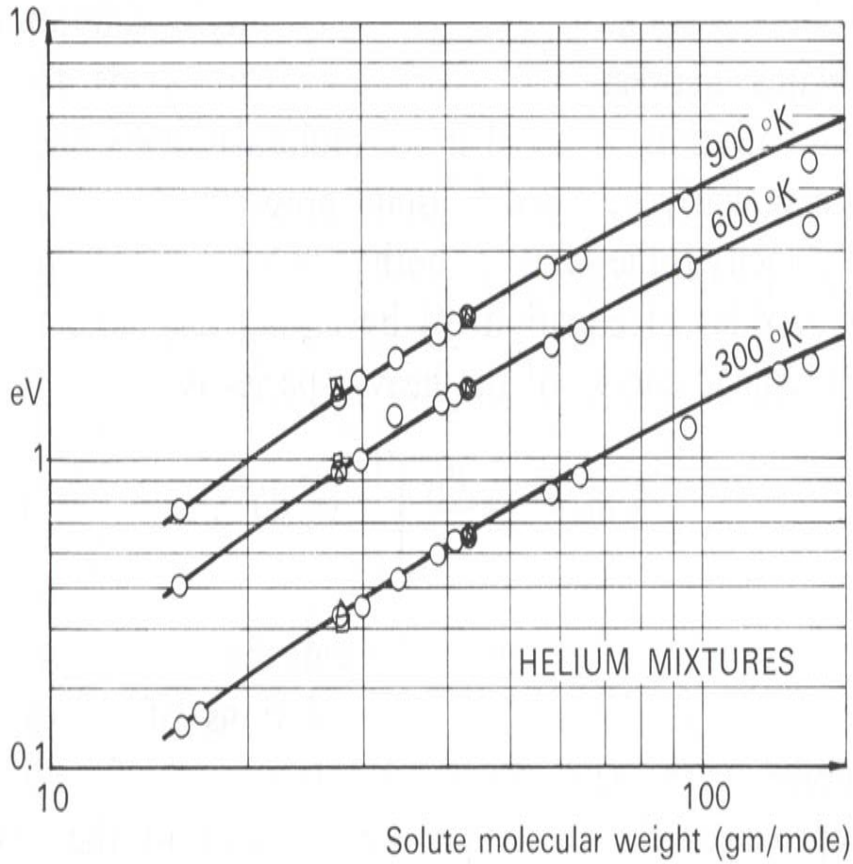
Temperature effects of free jet expansion

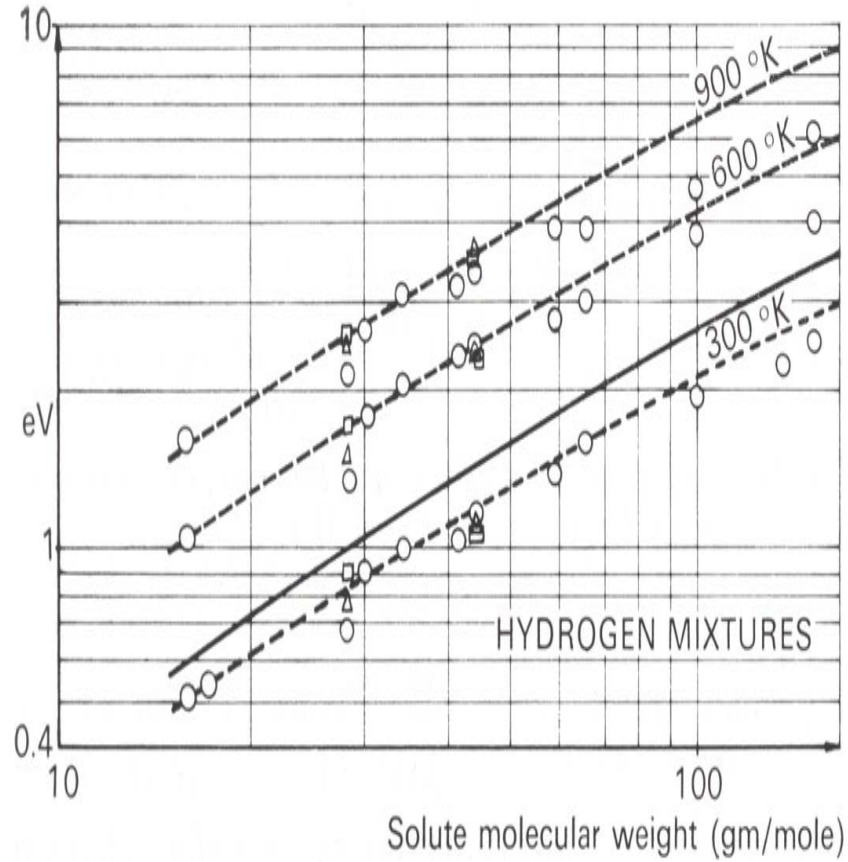



QUADRUPOLE
L3
L2
L1
0.62 cm
1.25 cm
R4
R1
NP
TC
G
HV

“Magic Number” of water clusters

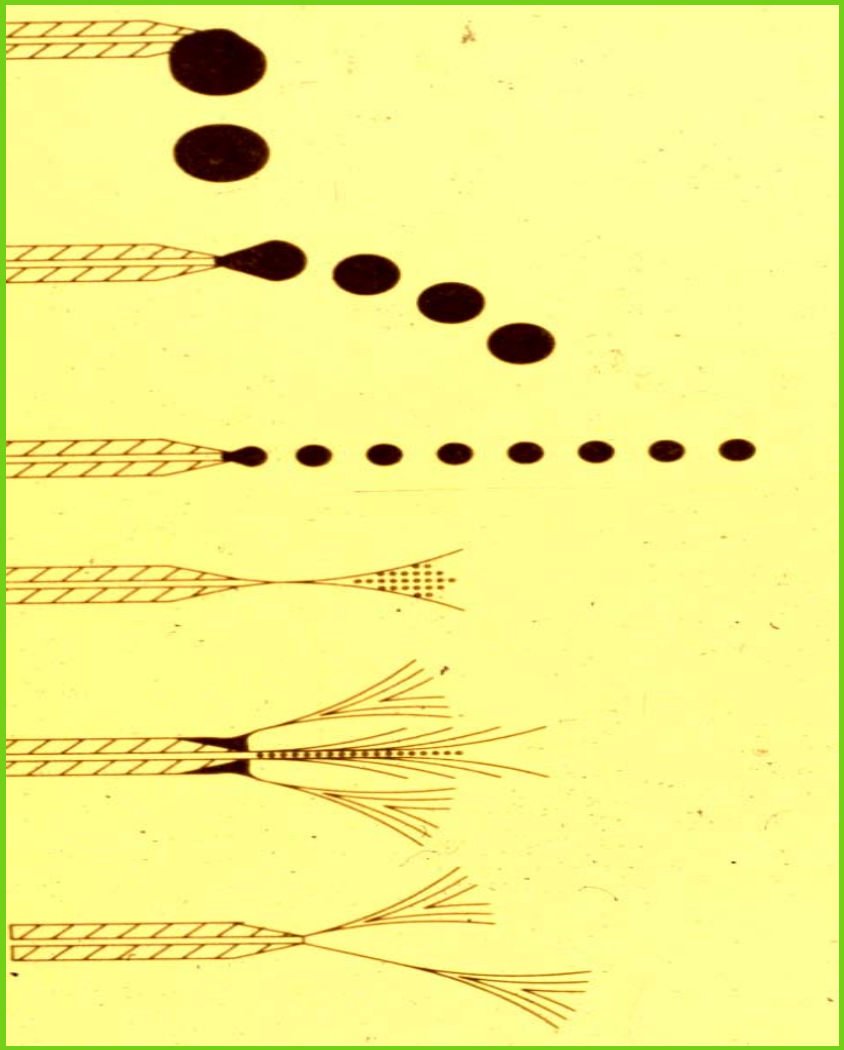


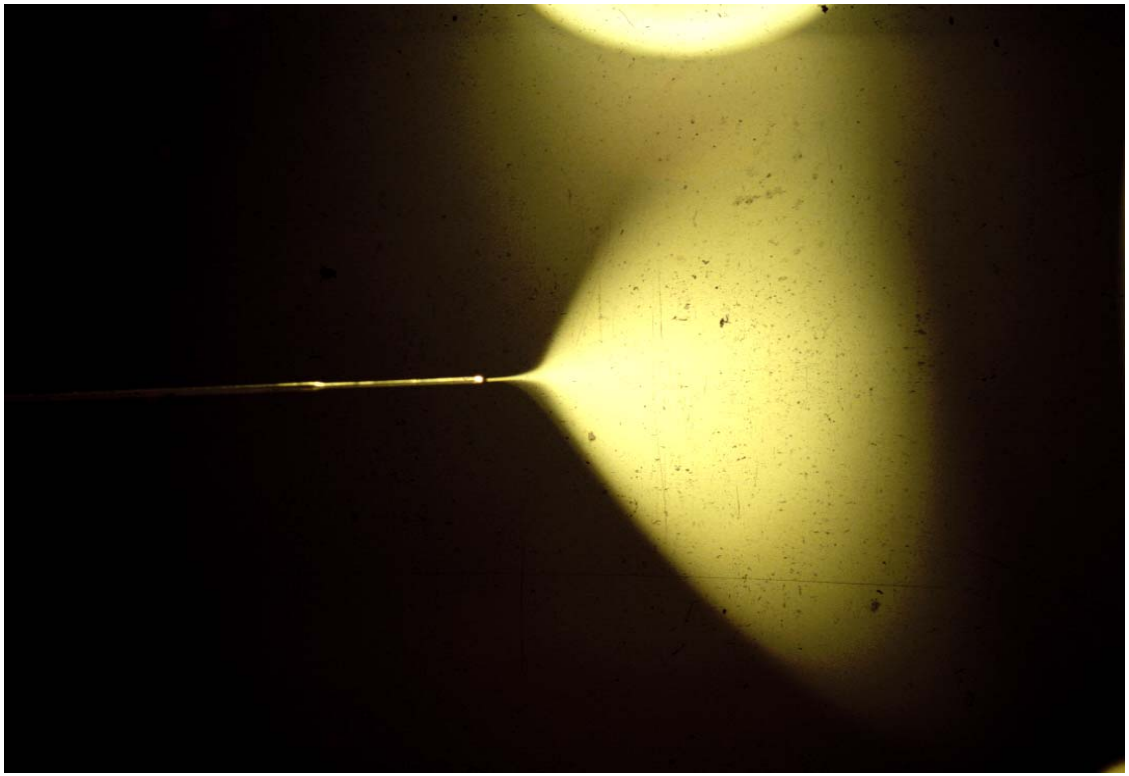

10
eV
1
0.1
10
100
900 °K
600 °K
300 °K
HELIUM MIXTURES
Solute molecular weight (gm/mole)


10
eV
1
0.4
10
100
900 °K
600 °K
300 °K
HYDROGEN MIXTURES
Solute molecular weight (gm/mole)

John Zeleny

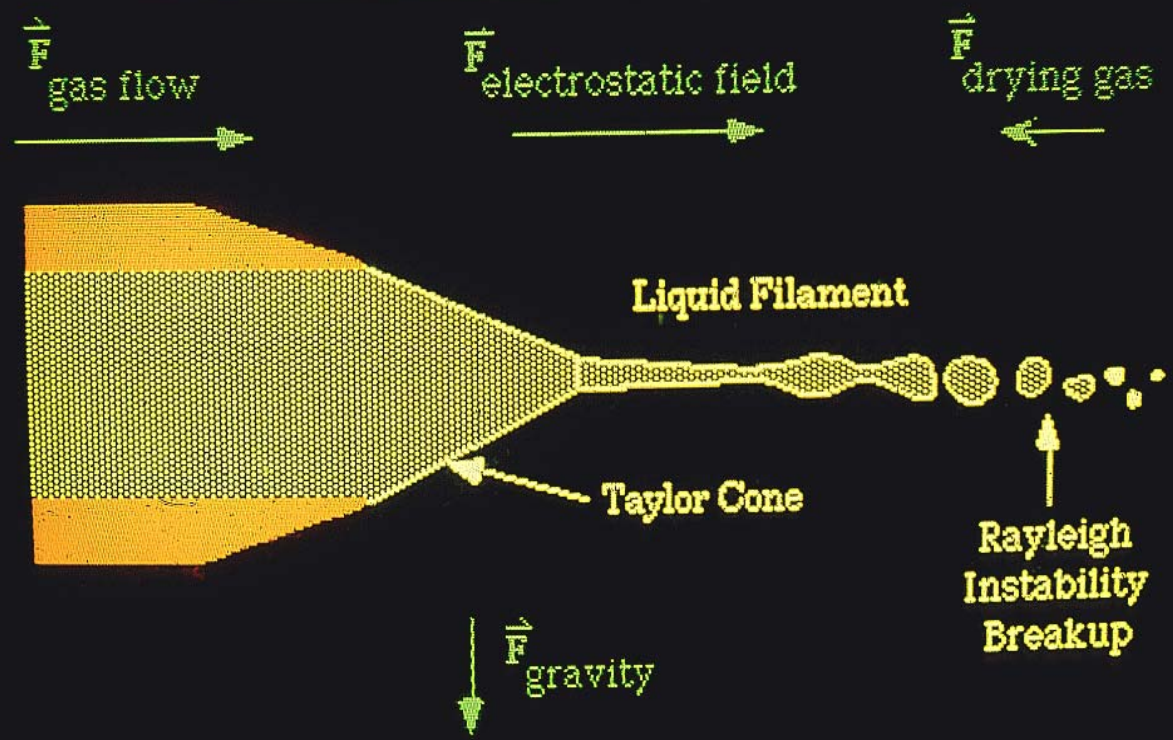
Electrospray Profiles

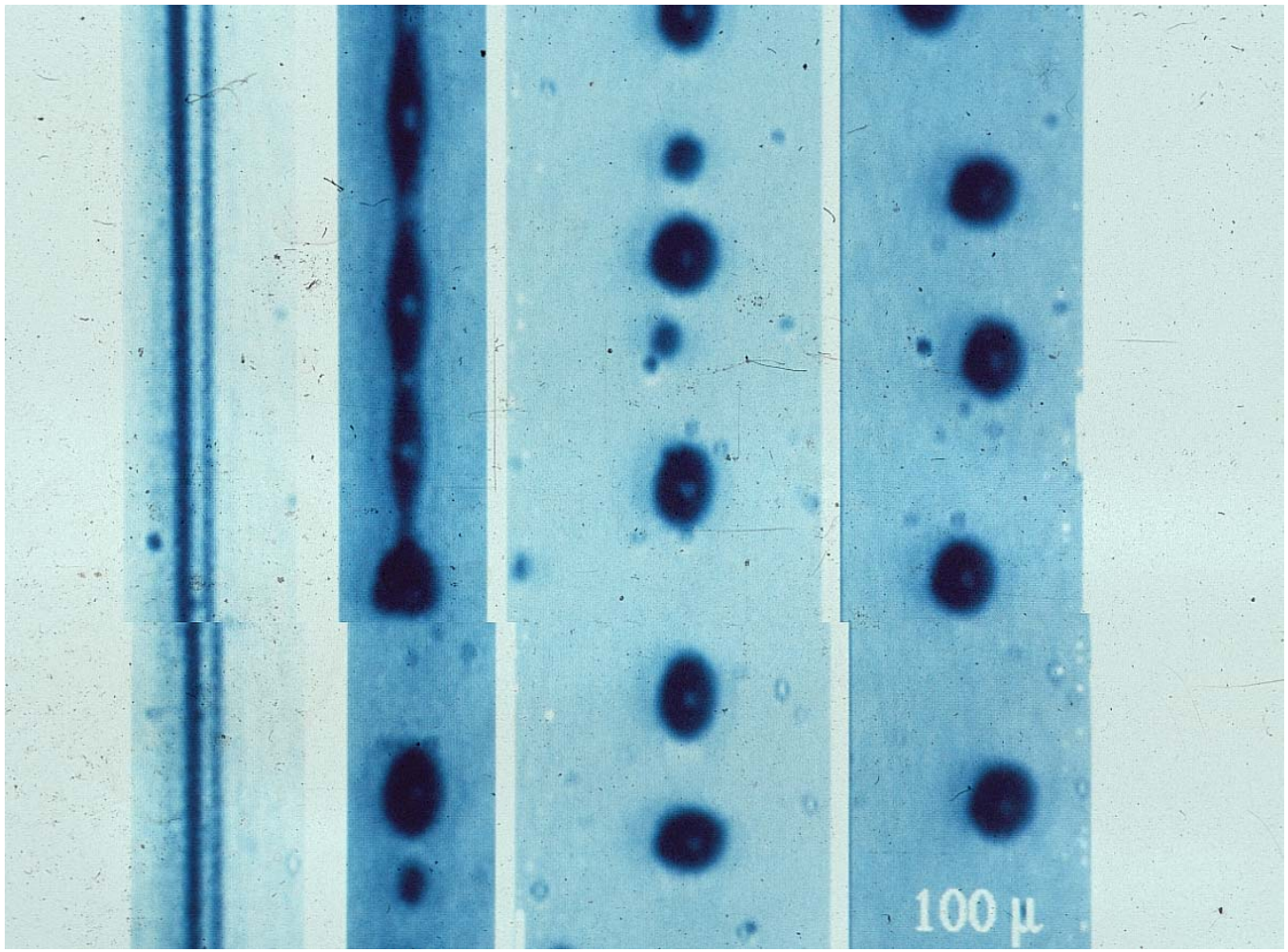


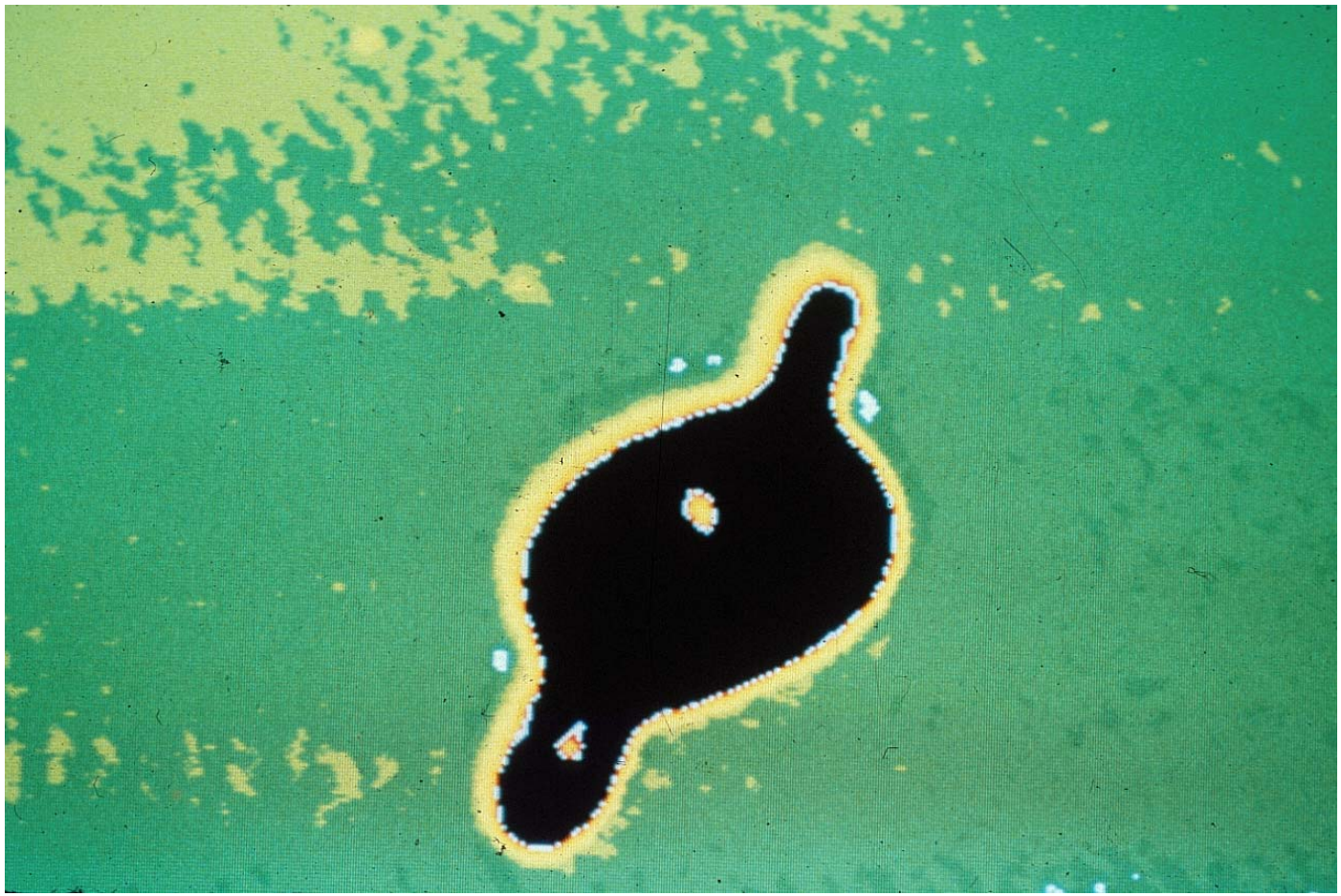


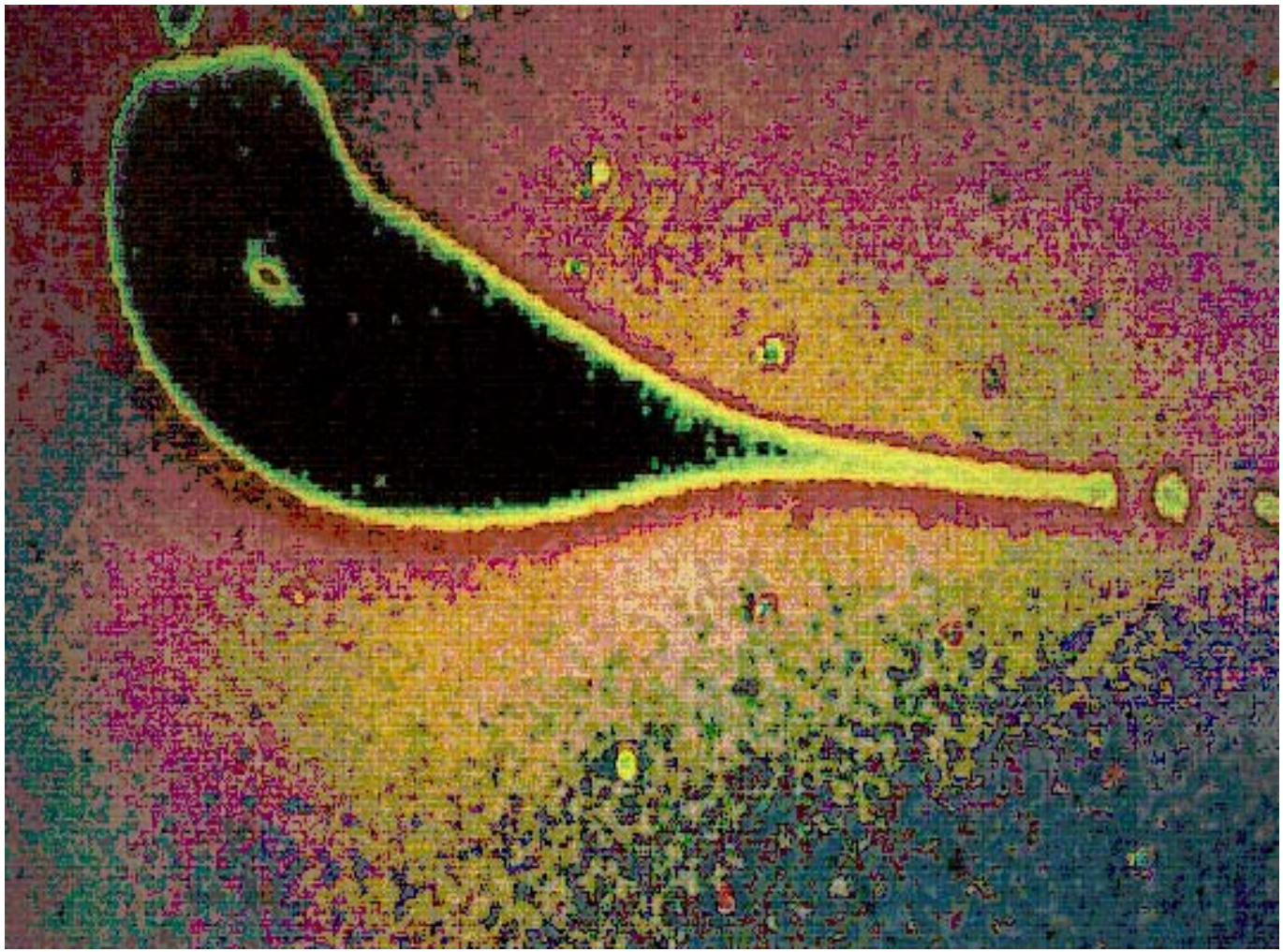
Lord Rayleigh

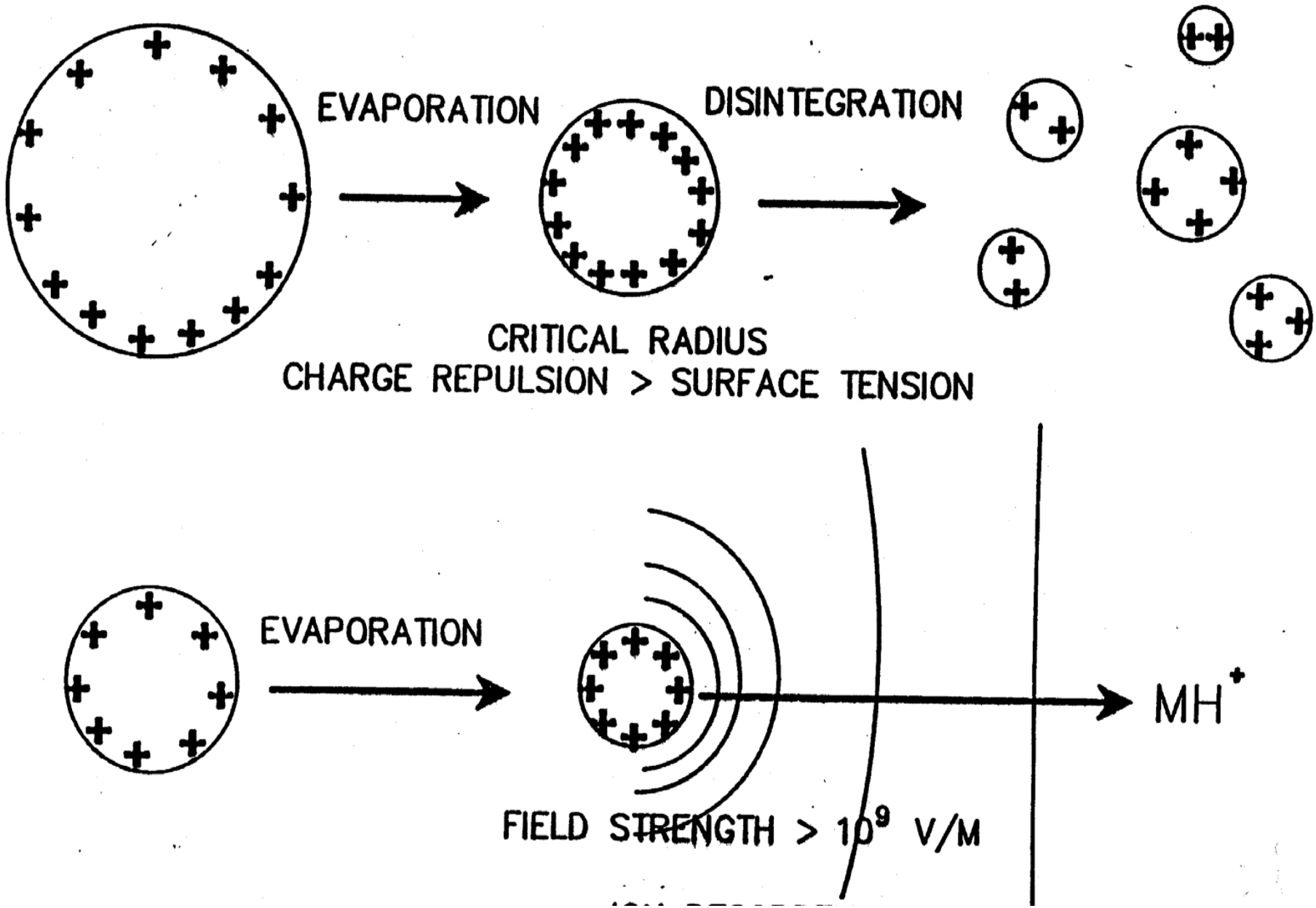
Electrospray Charged Droplet Formation



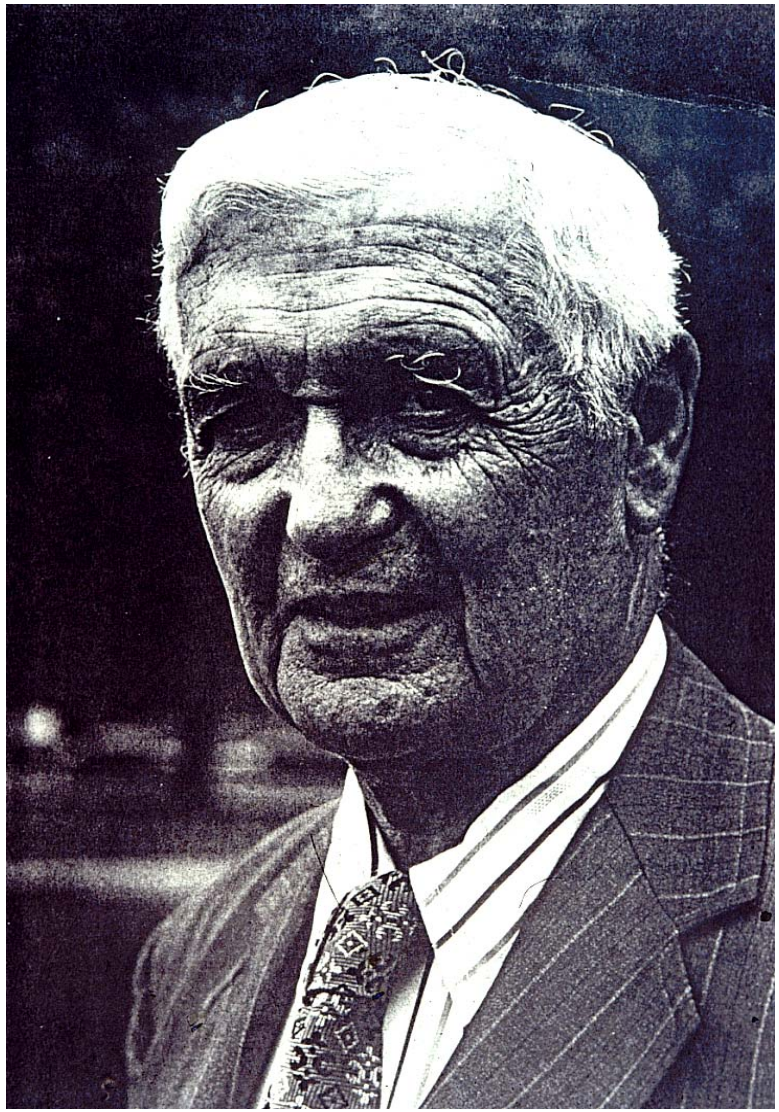

100 µ



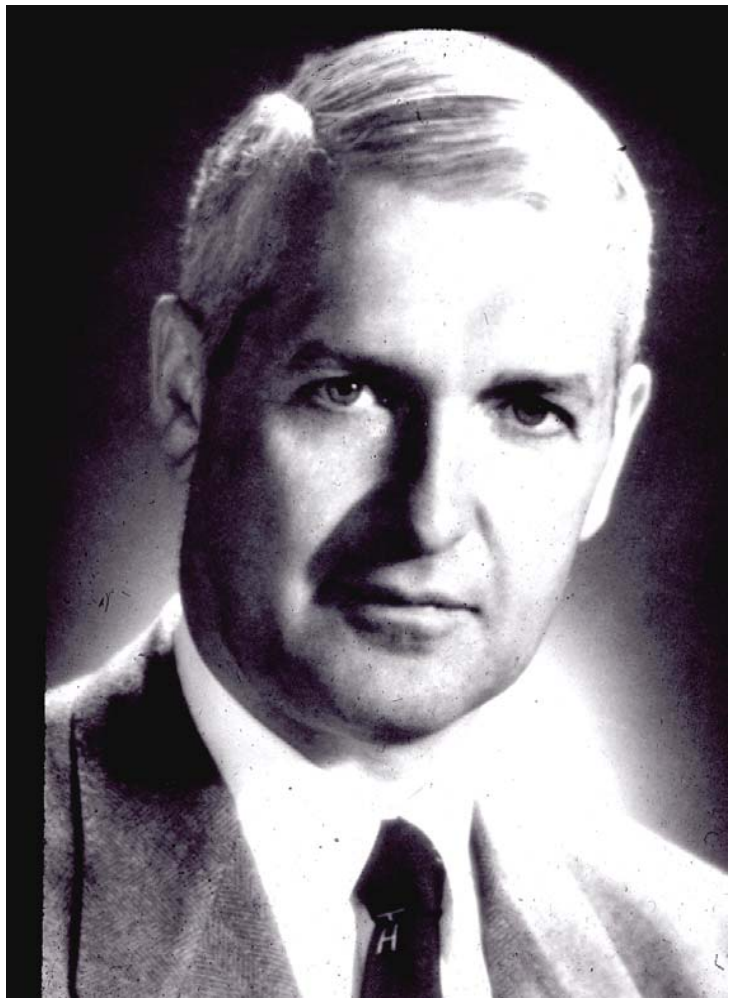



EVAPORATION
DISINTEGRATION
CRITICAL RADIUS
CHARGE REPULSION > SURFACE TENSION
EVAPORATION
MH+
FIELD STRENGTH > 10^9 V/M

Malcolm Dole

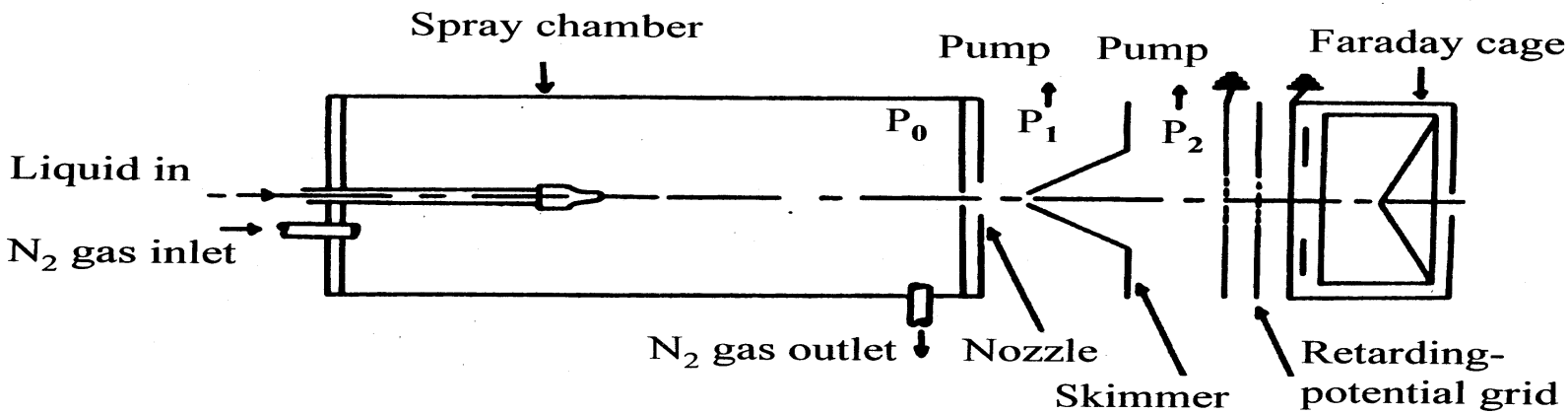


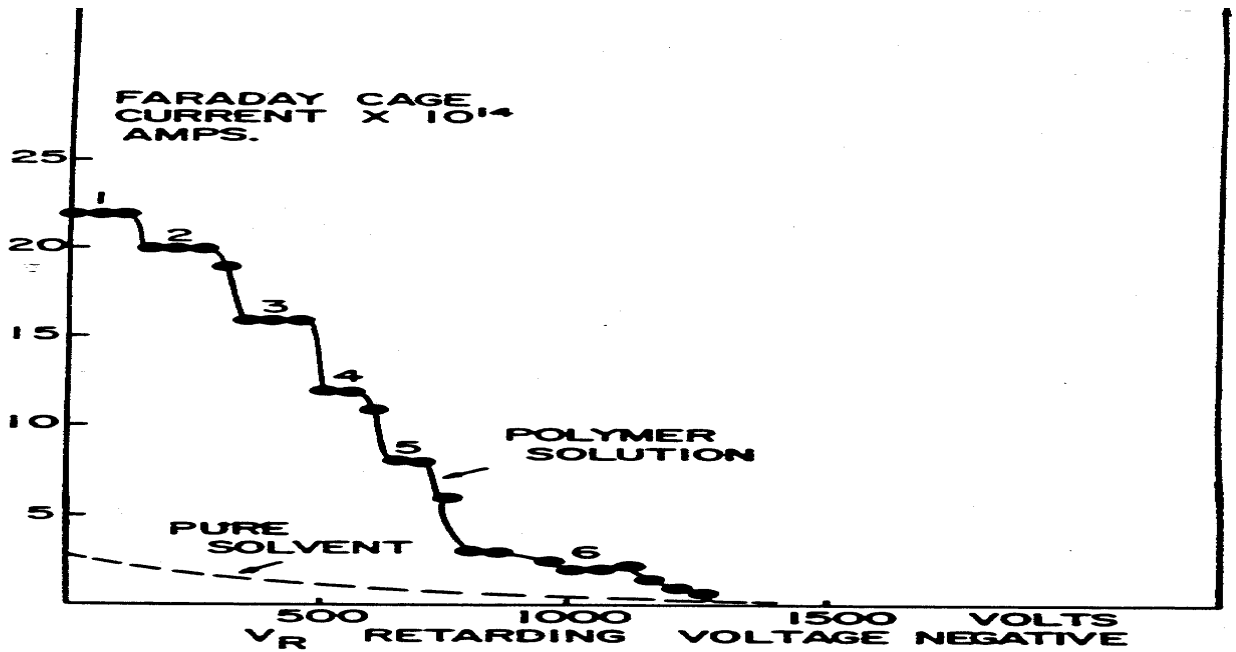
Malcolm Dole



Julio Iribarne

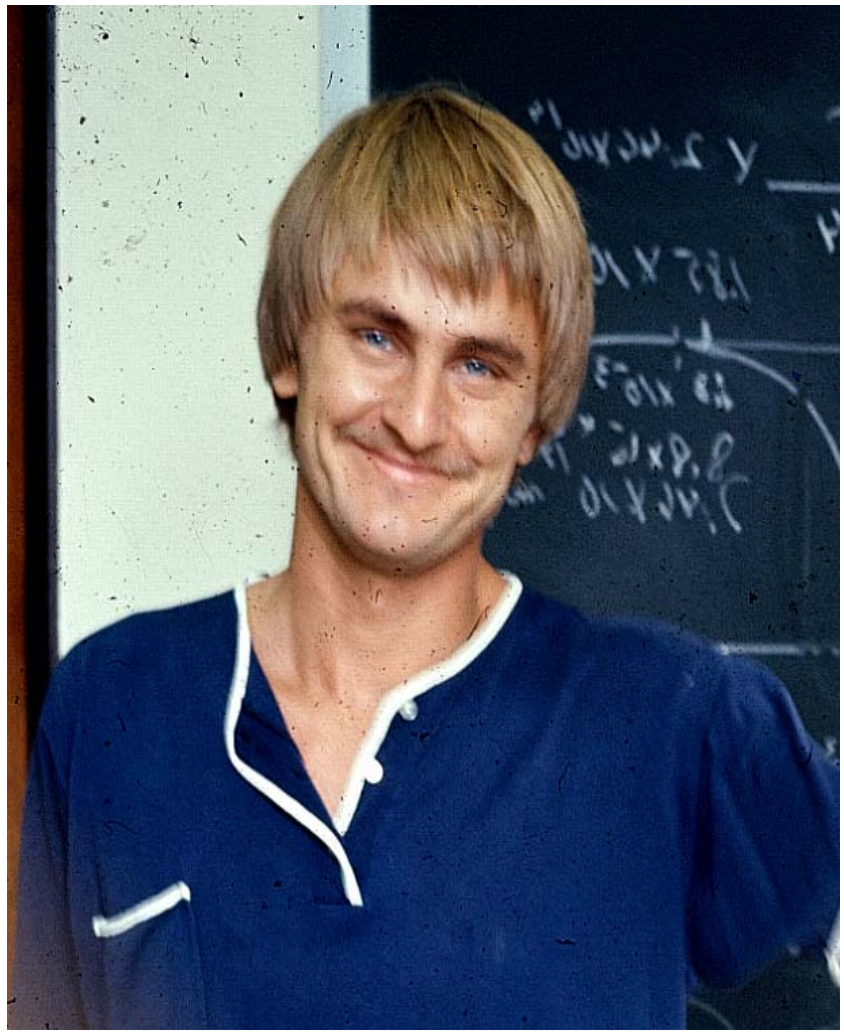
Molecular Beams of Macroions



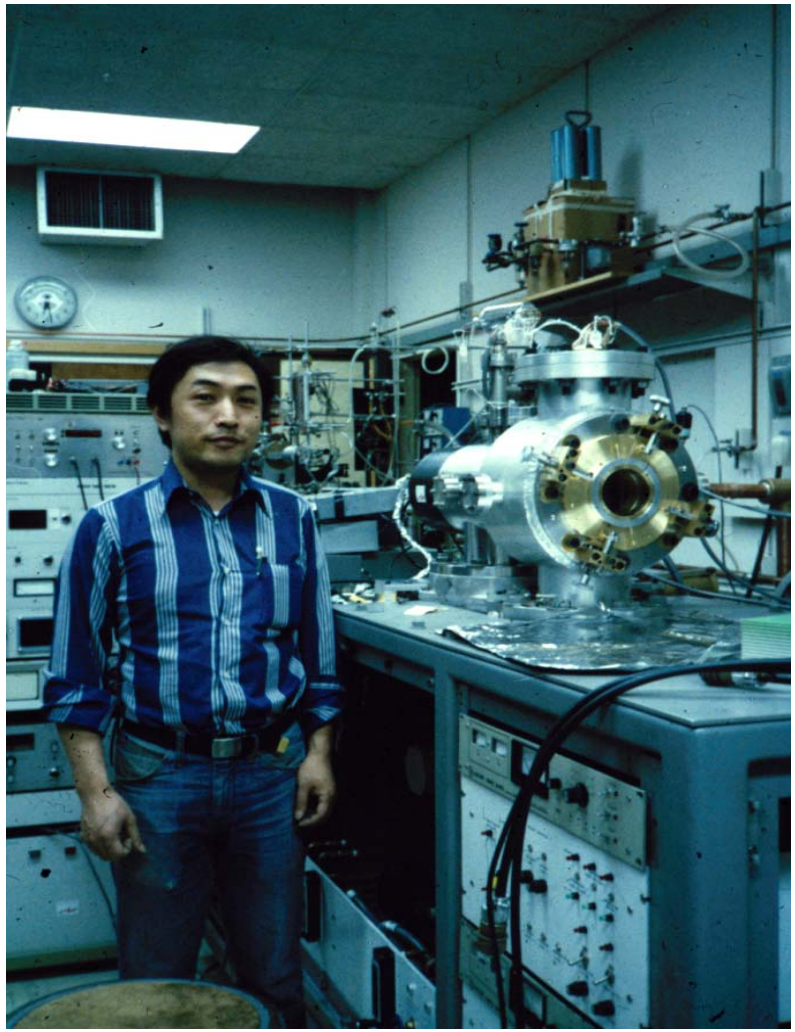


Dole, M.; Mack, L. L.; Hines, R. L. *J. Chem. Phys.*, **1968,** 49, 2240-2249

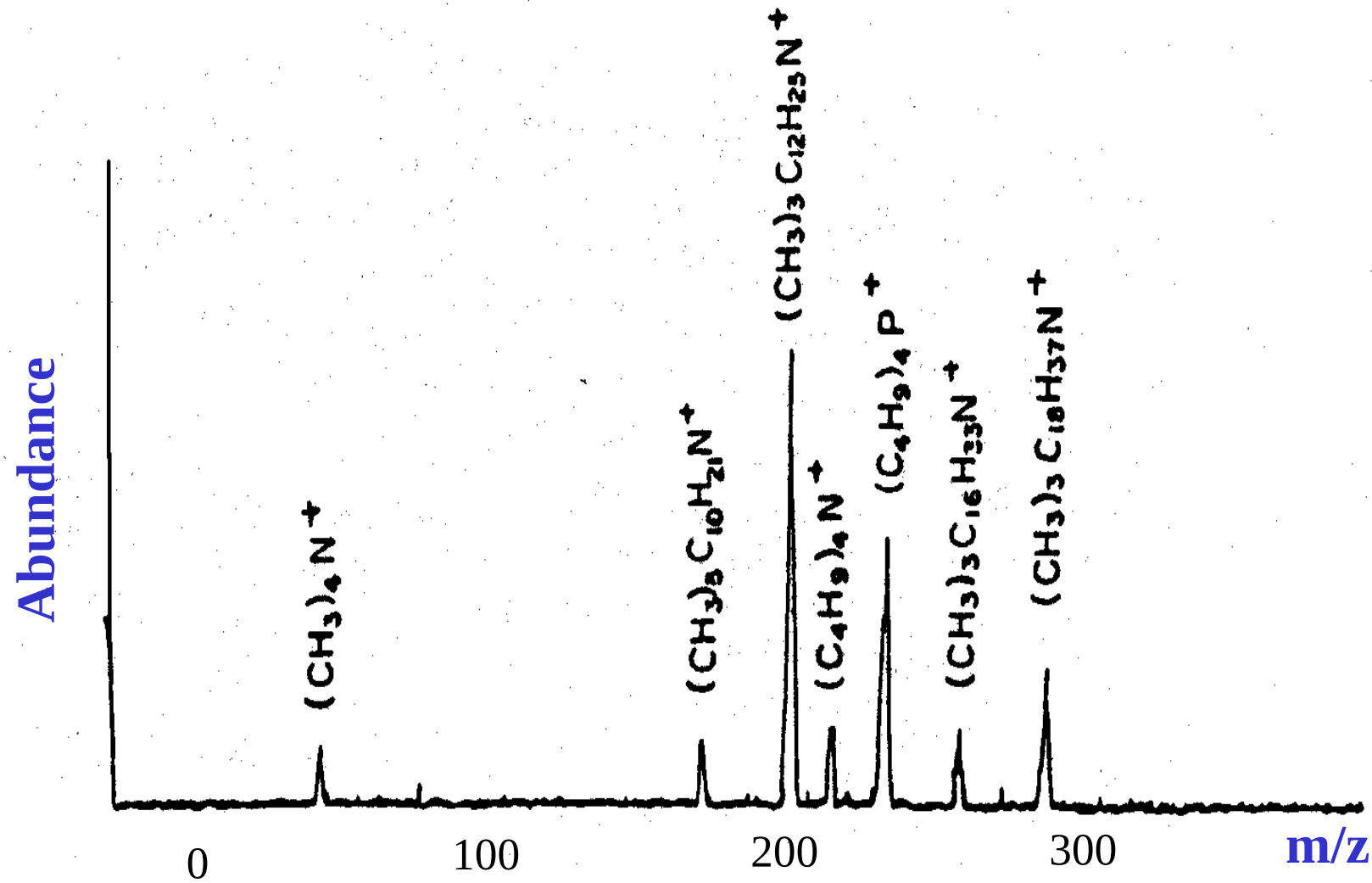
Mike Labowsky



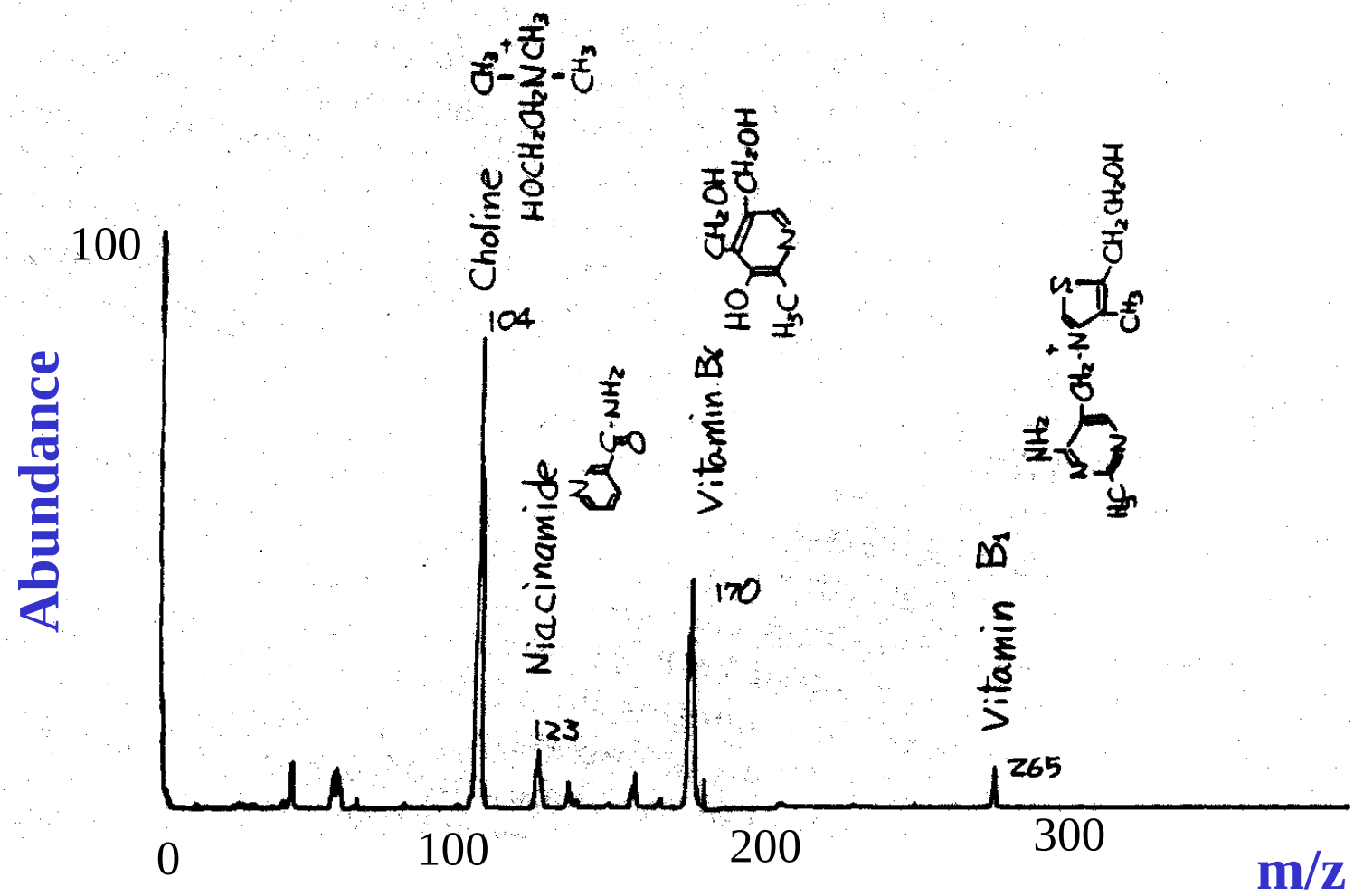
Masamachi Yamashita



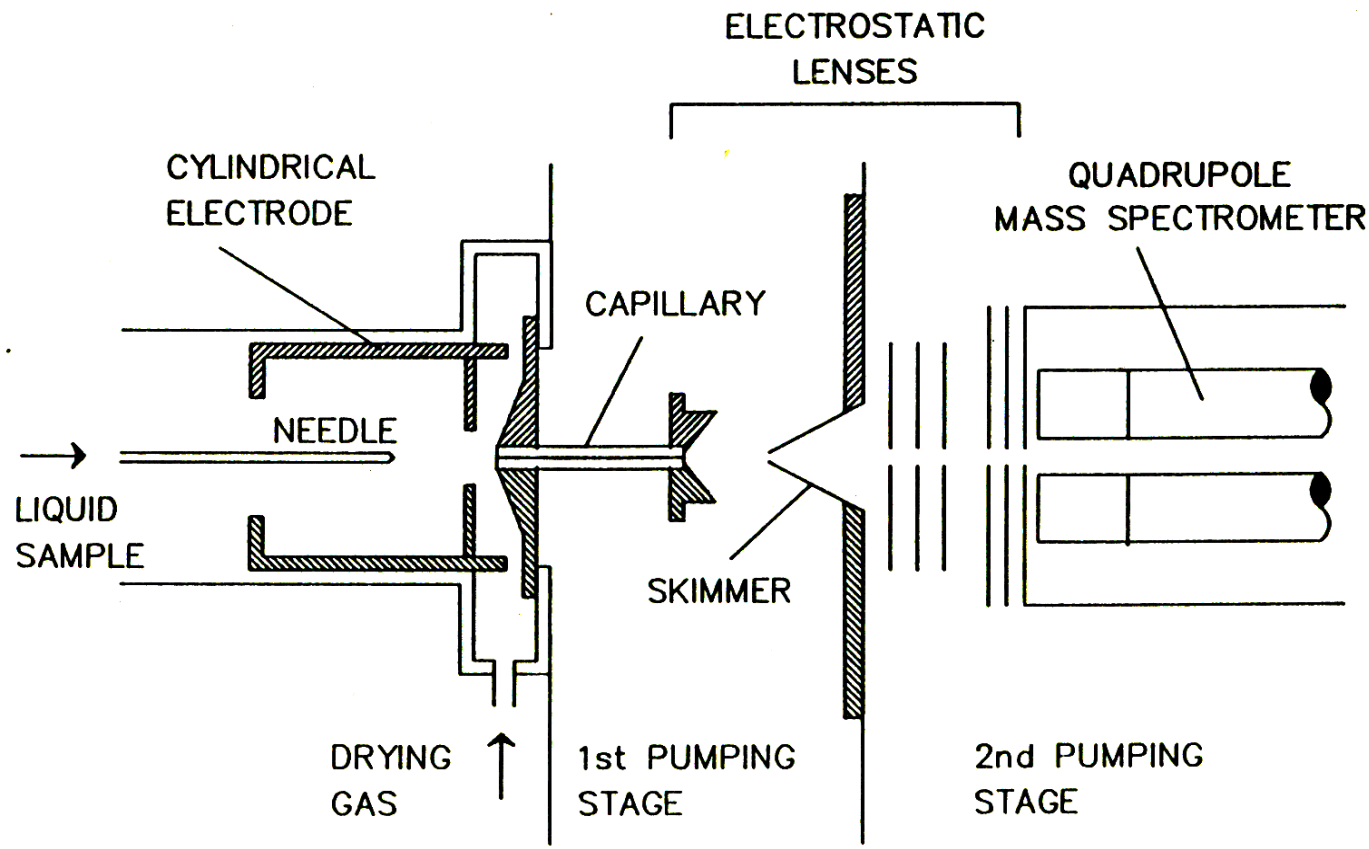
ESI-Mass Spectrum of Various Alkyl Ammonium Compounds



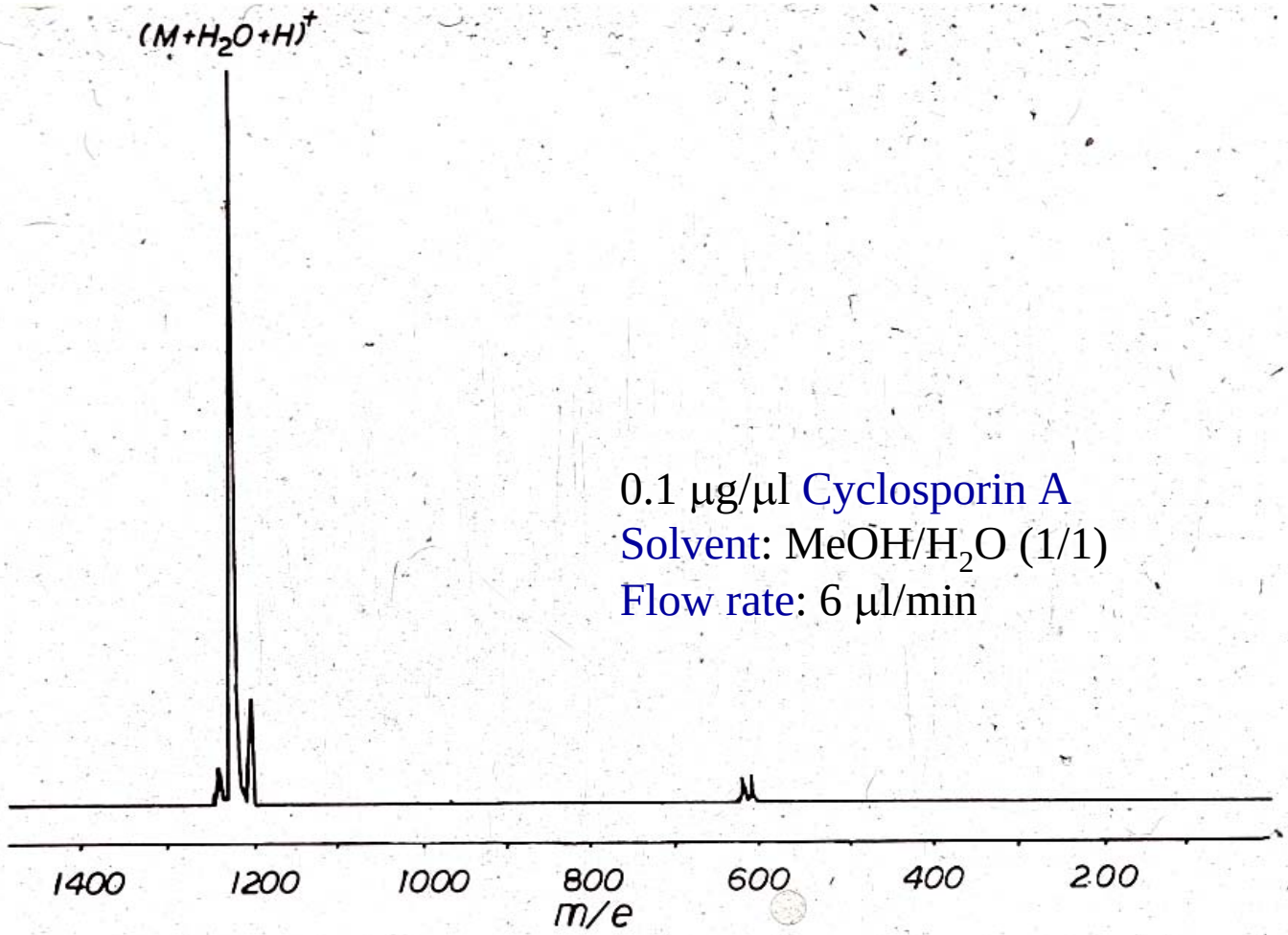
ESI-Mass Spectrum of an Extract of a Vitamin B Tablet



A Schematic Diagram of An Electrospray Ionization Mass Spectrometer

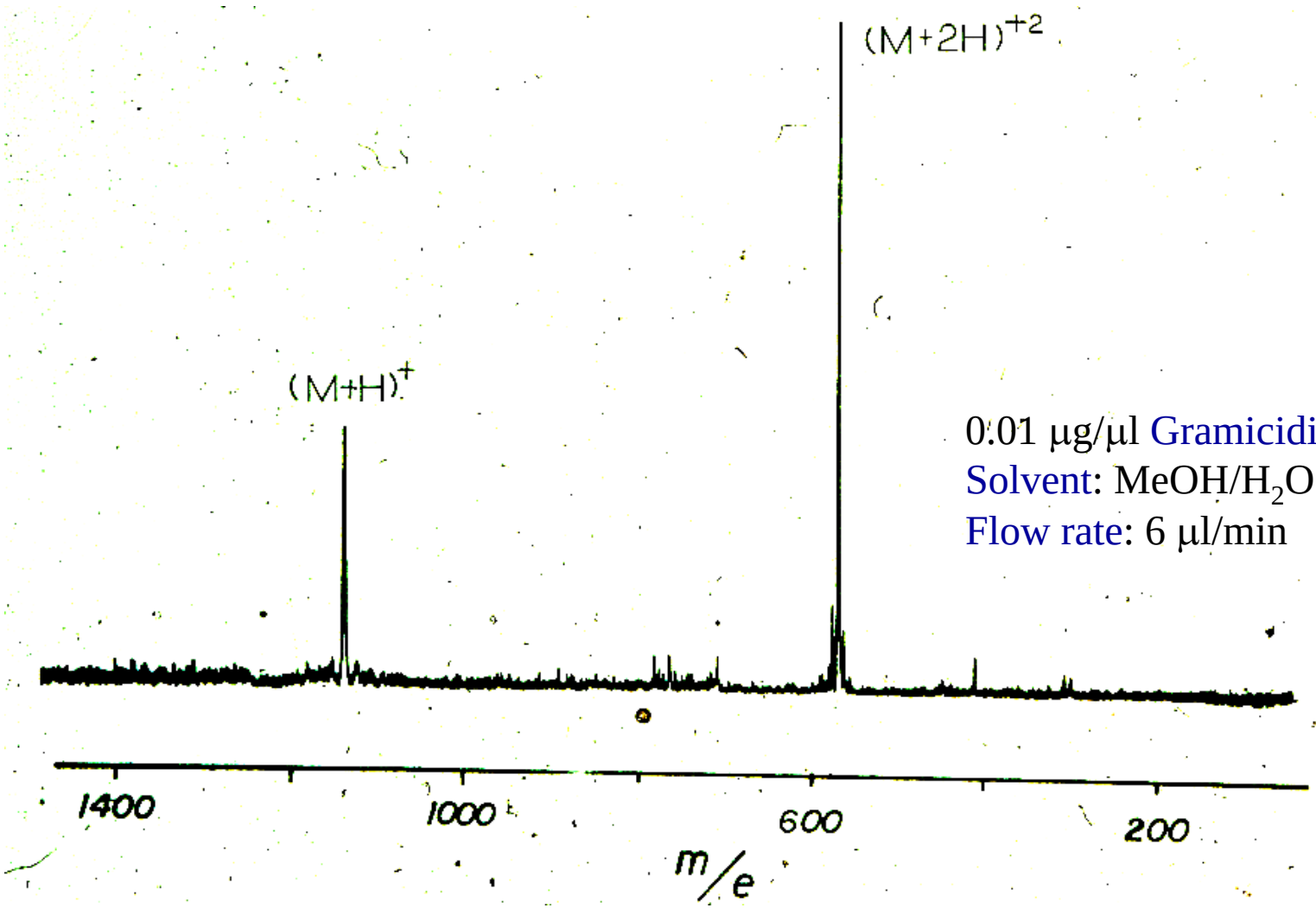


ESI-Mass Spectrum of Cyclosporin A



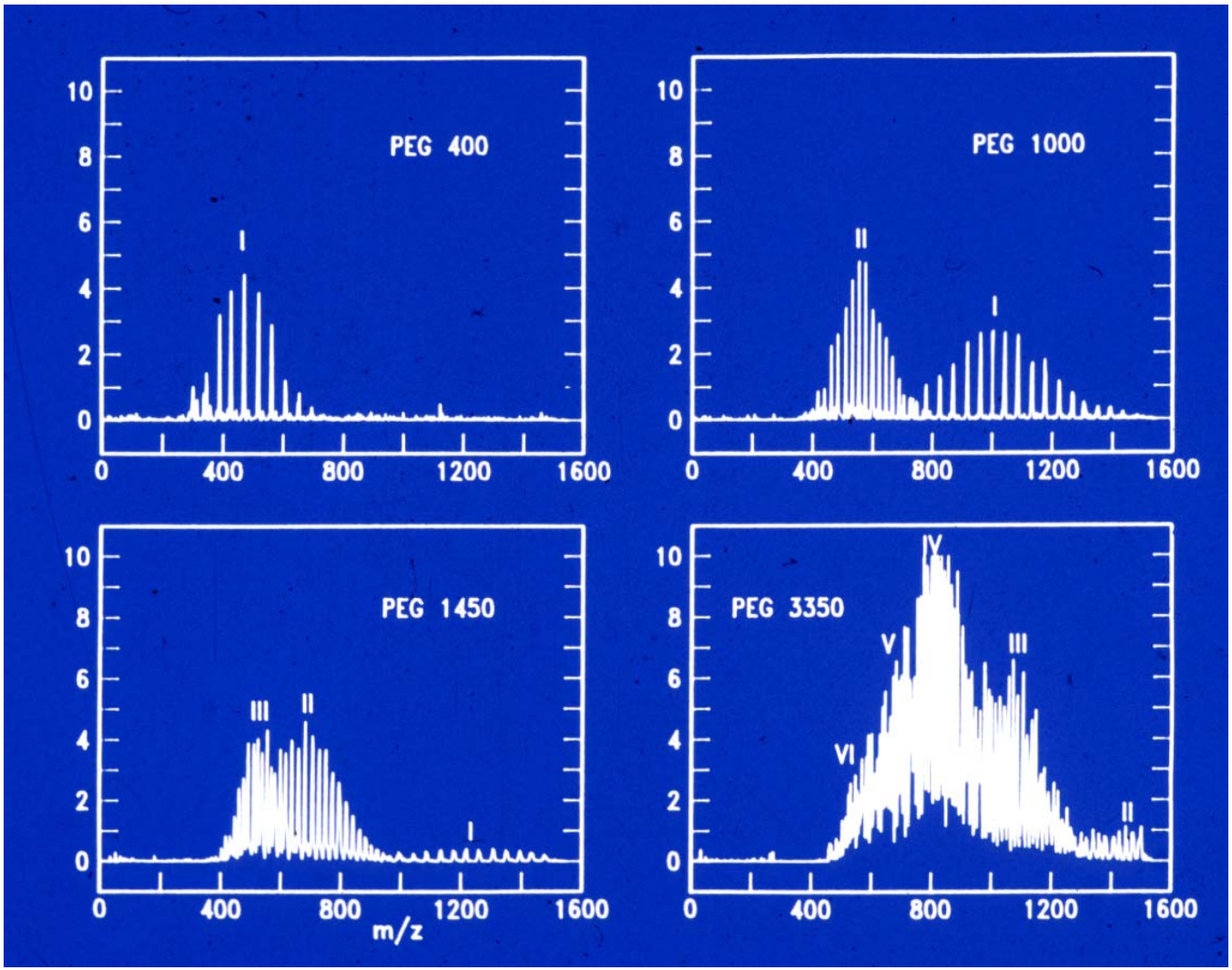
0.1 μg/μl Cyclosporin A
Solvent: $MeOH/H_2O$ (1/1)
Flow rate: 6 μl/min

ESI-Mass Spectrum of Gramicidin S

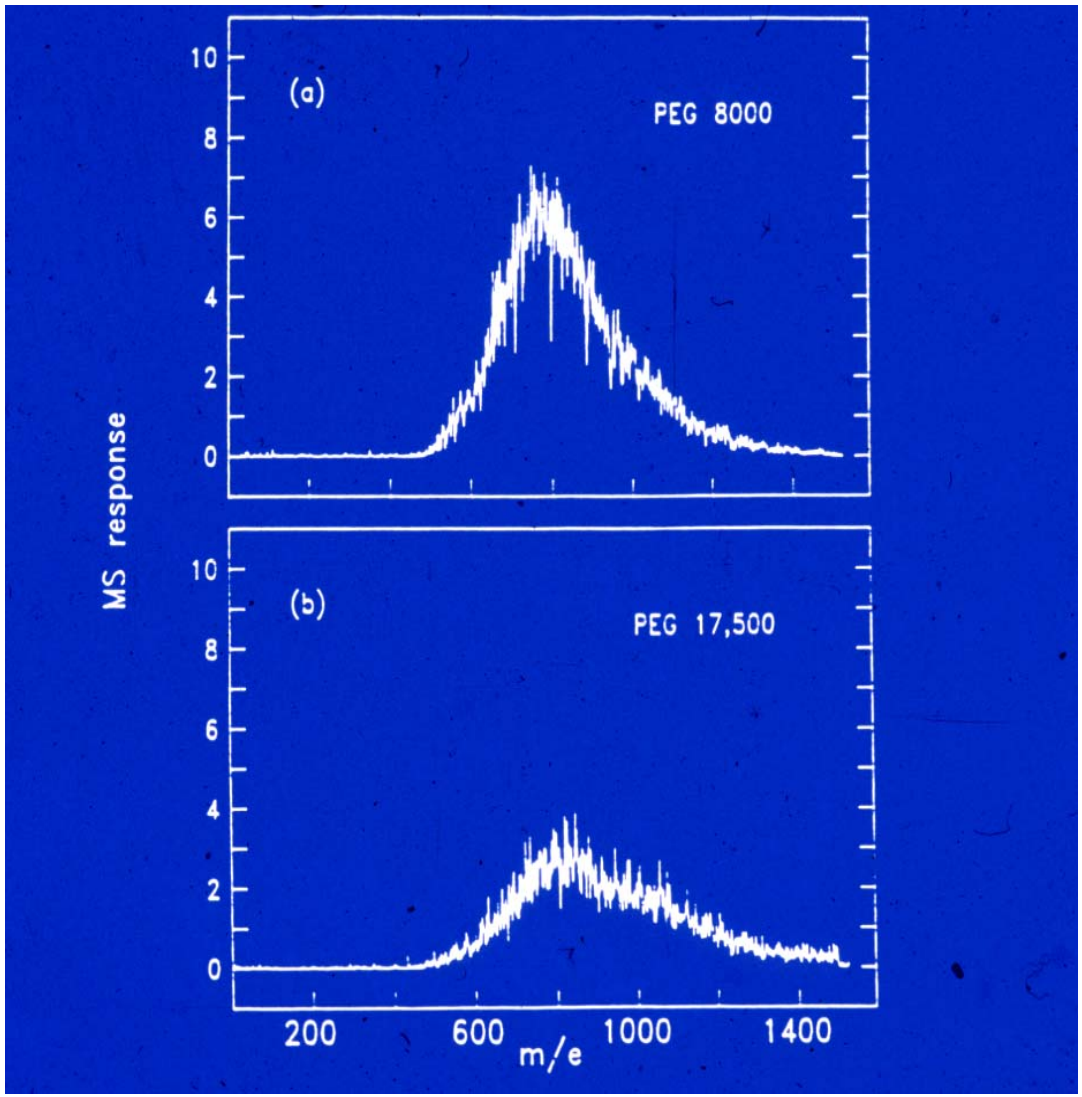


0.01 μg/μl Gramicidin S
Solvent: MeOH/H_2O (1/1)
Flow rate: 6 μl/min

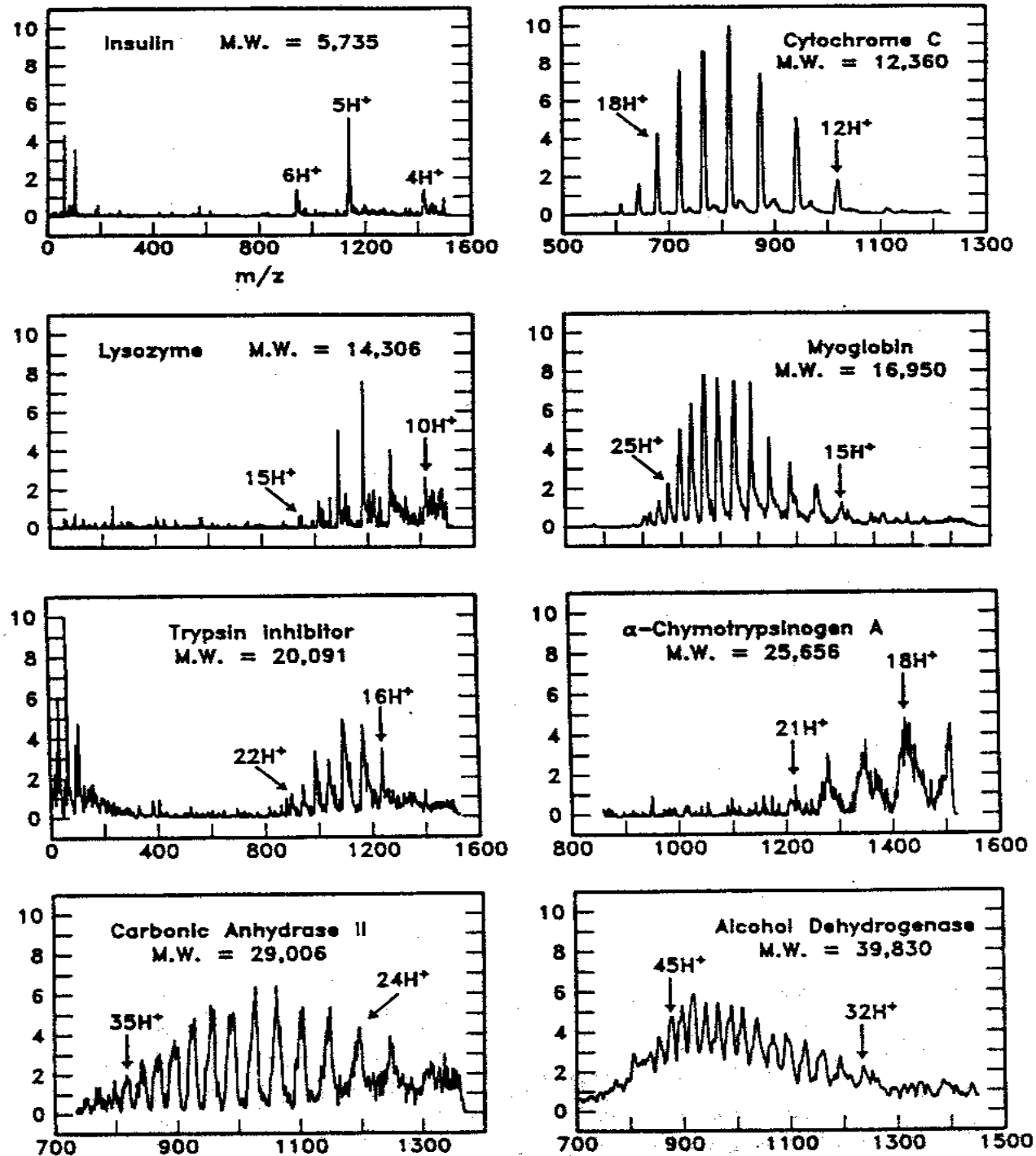
ESI-Mass Spectra of Polyethylene Glycol



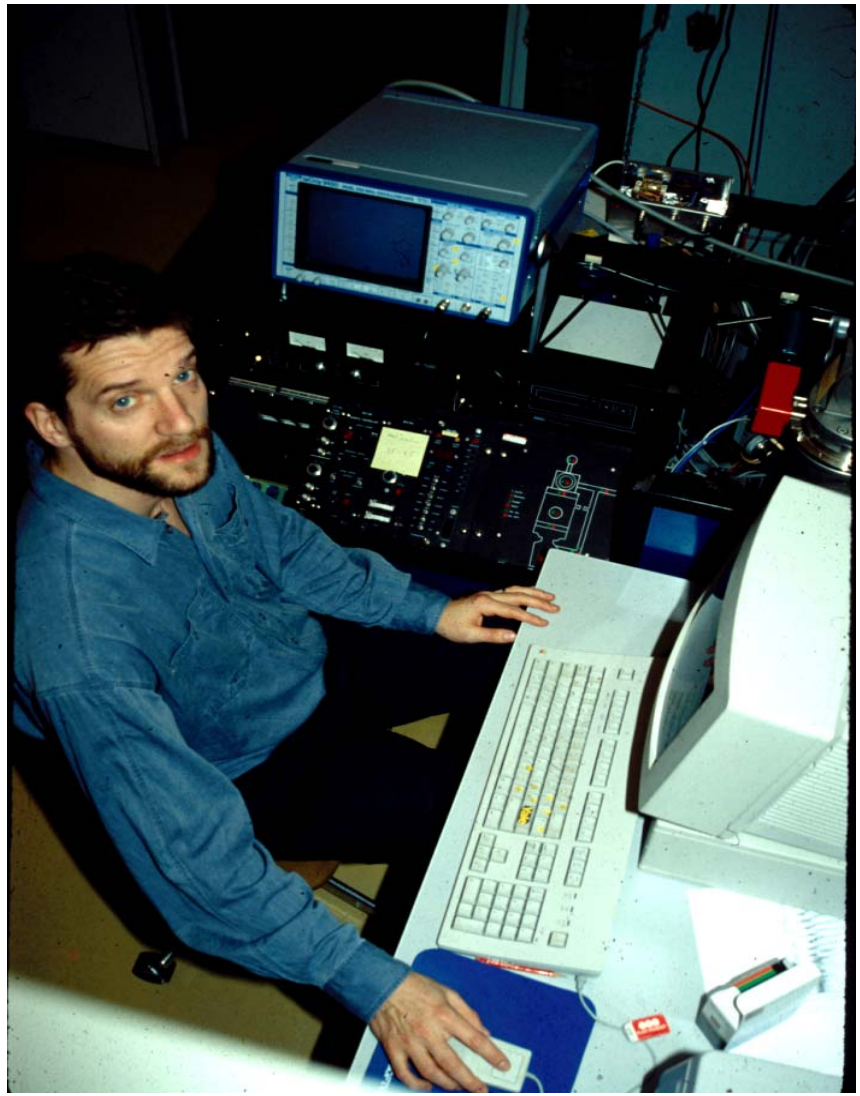
ESI-Mass Spectra of Polyethylene Glycol



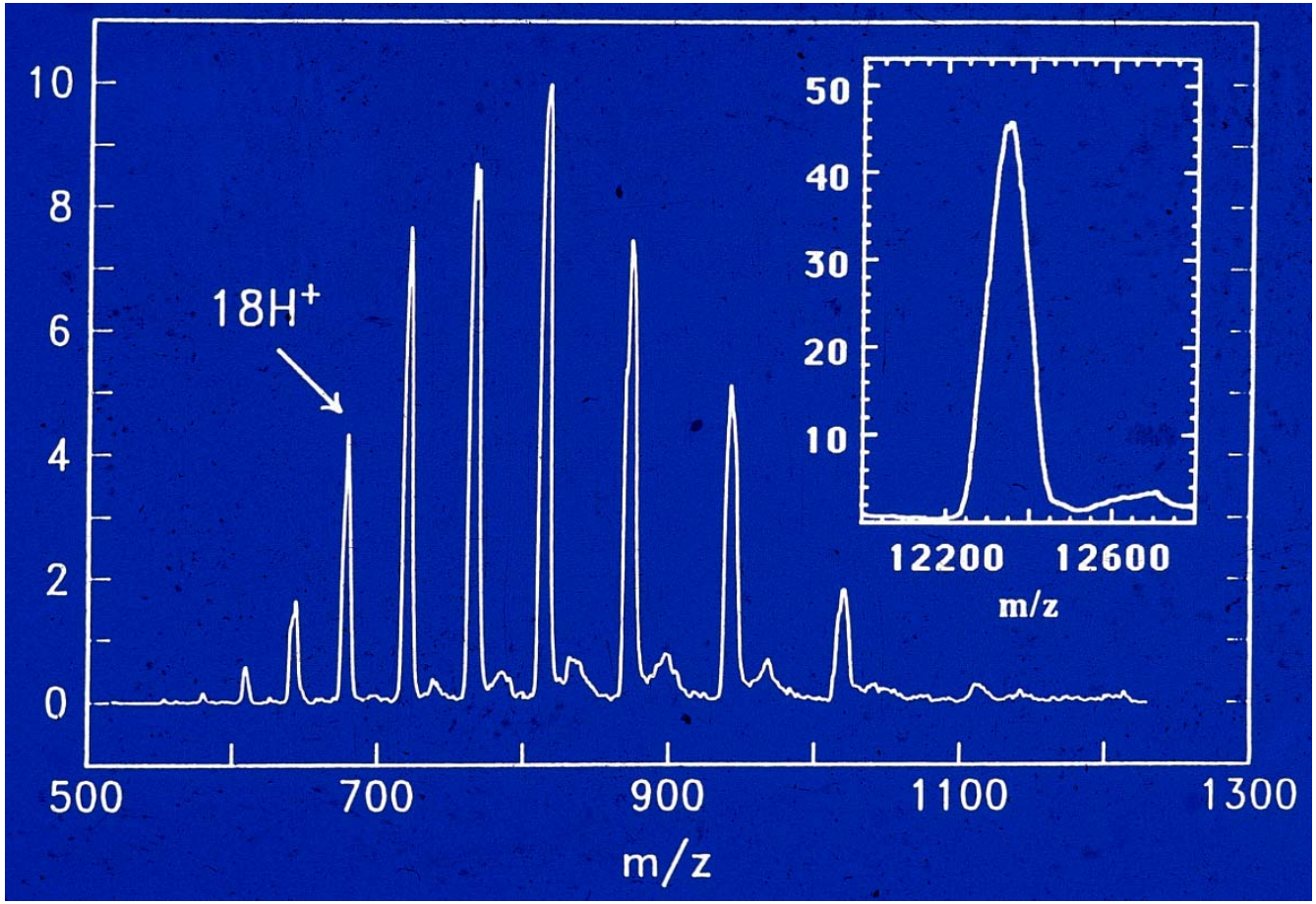
ESI-Mass Spectra of Selected Proteins



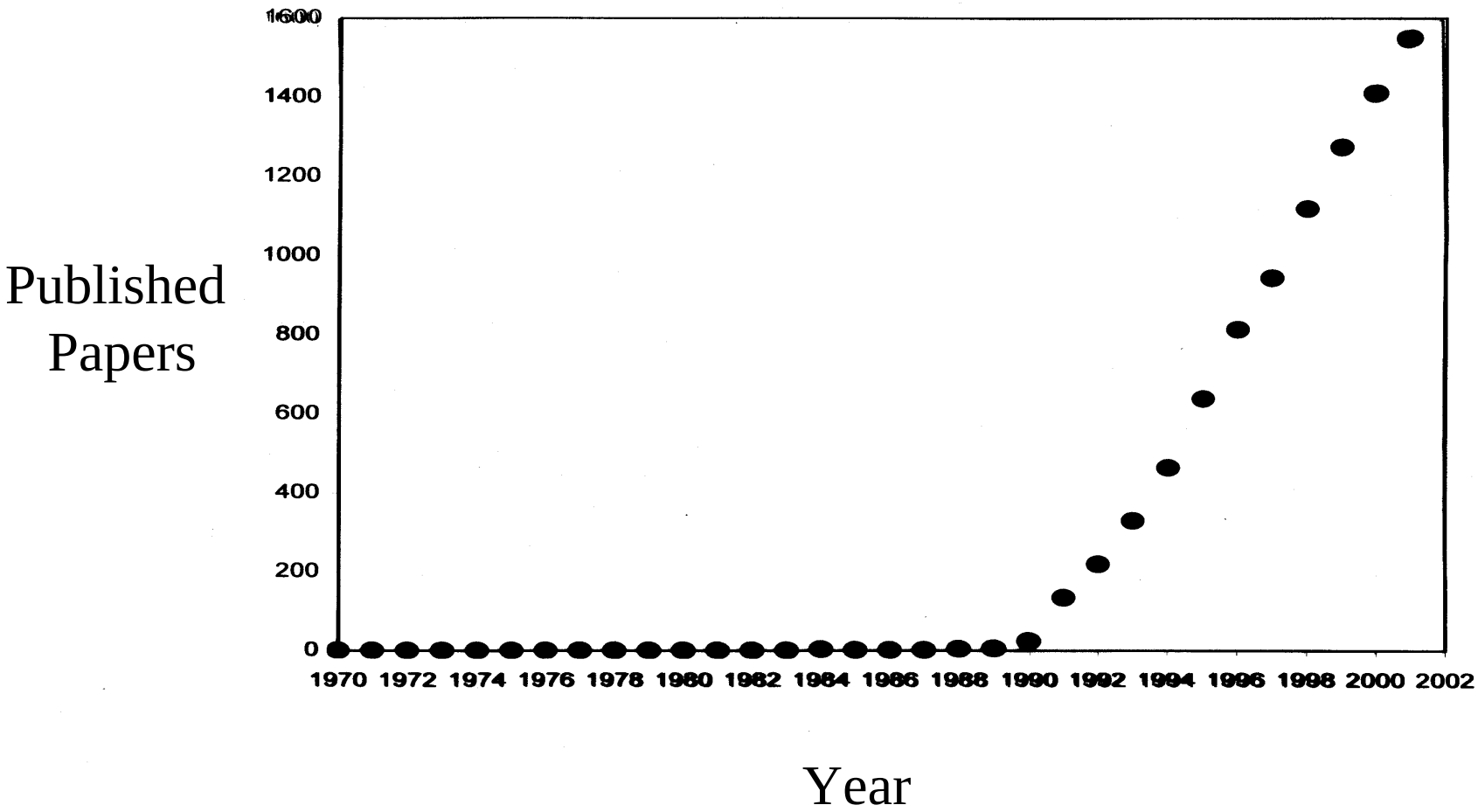
Matthias Mann

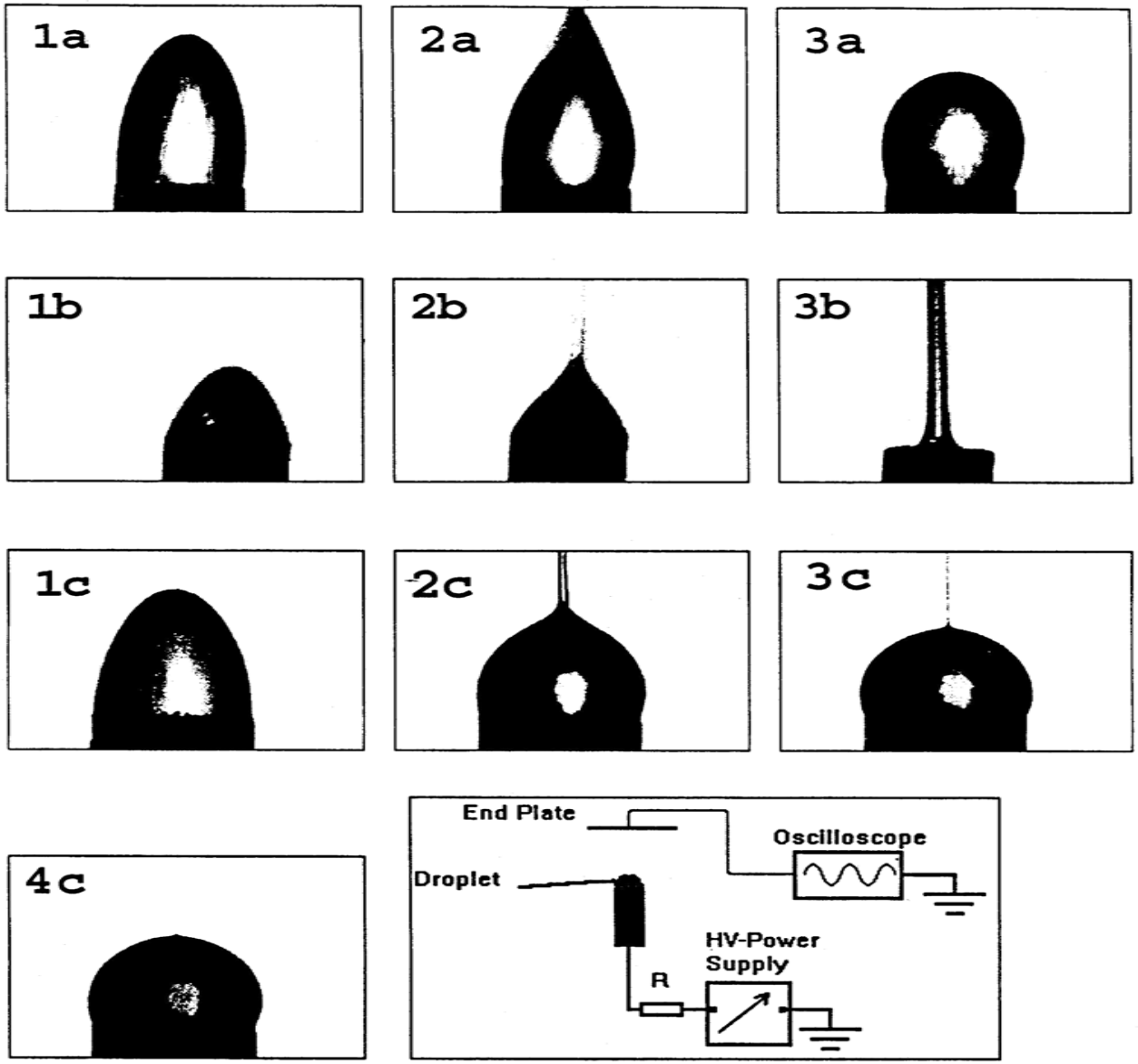


ESI Mass Spectrum of Denatured Cytochrome C



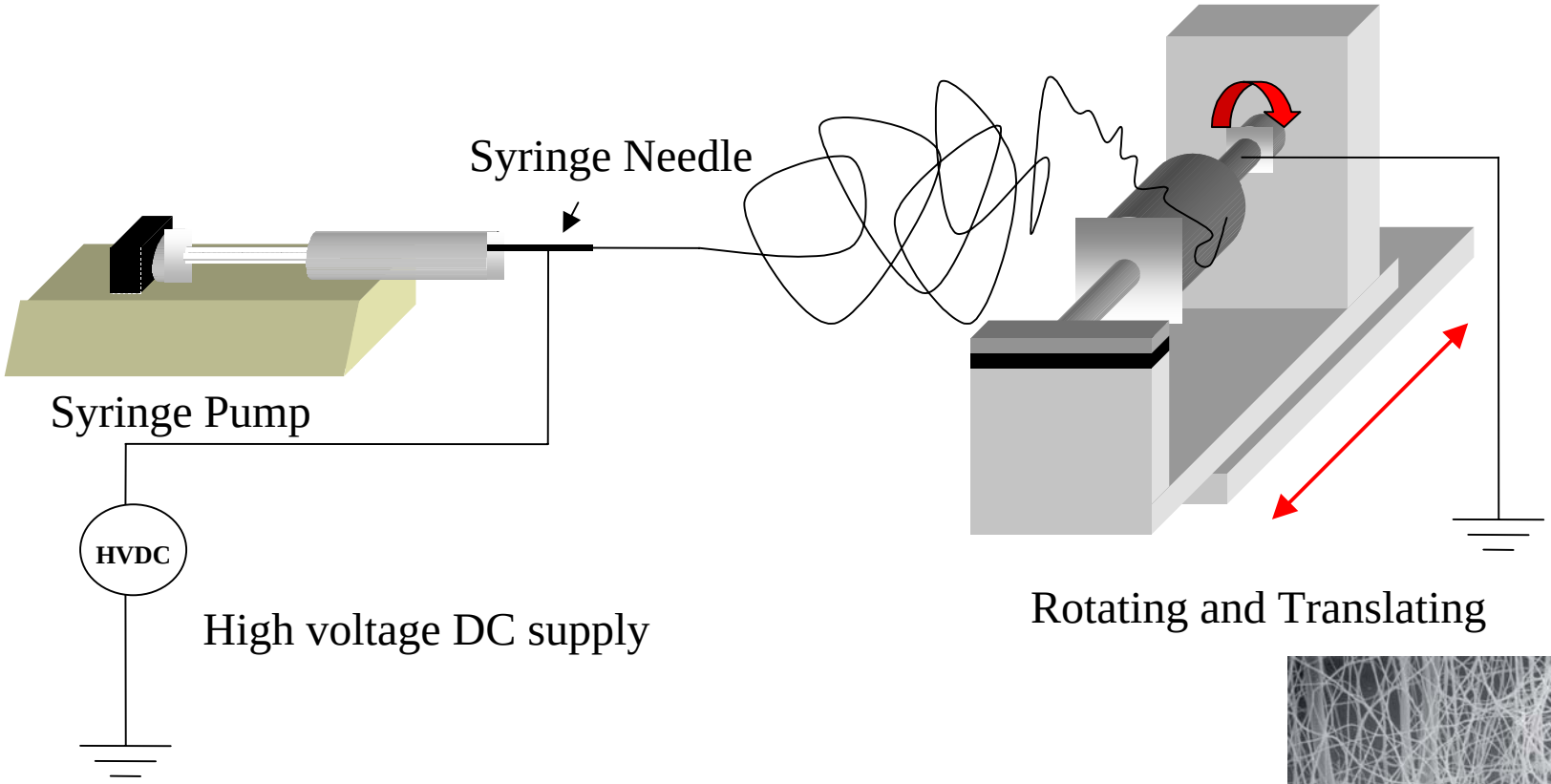
Science Citation Index



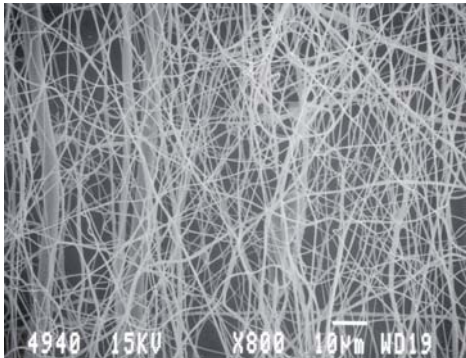


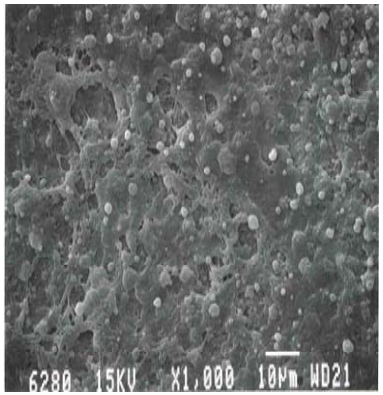
a - Glycerol with traces of water
b - 5% PEG-5M in benzyl alcohol
c - 1.5% PEG-600K in benzyl alcohol

Electrospinning

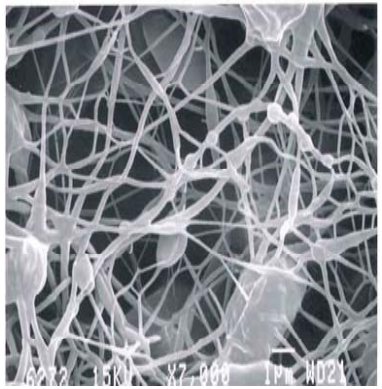


PVA

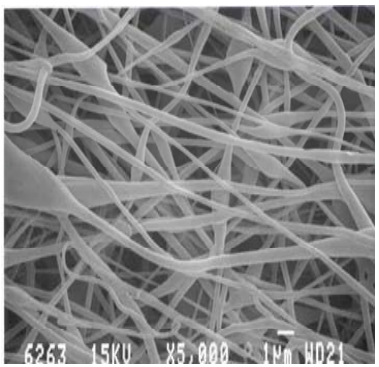




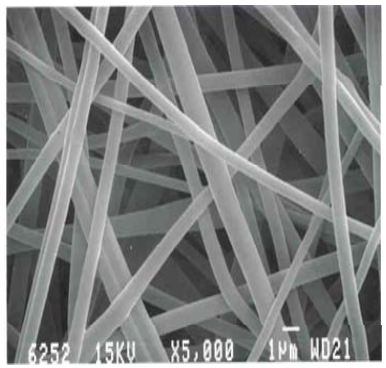
2.5%



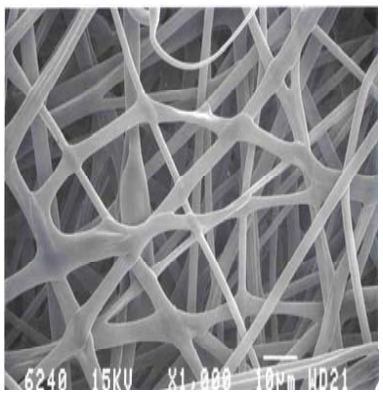
5 %



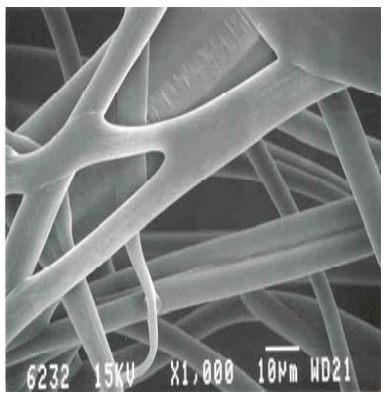
7.5%



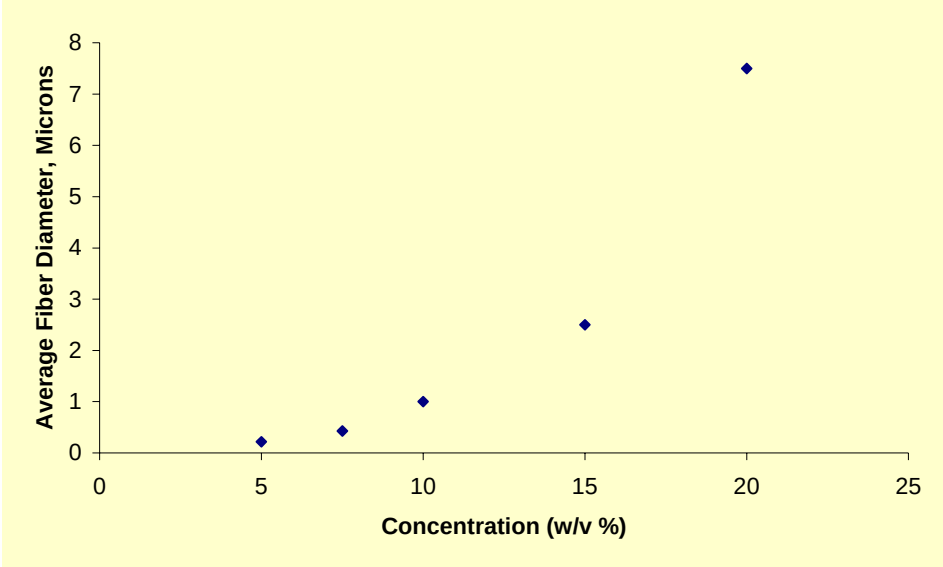
10%

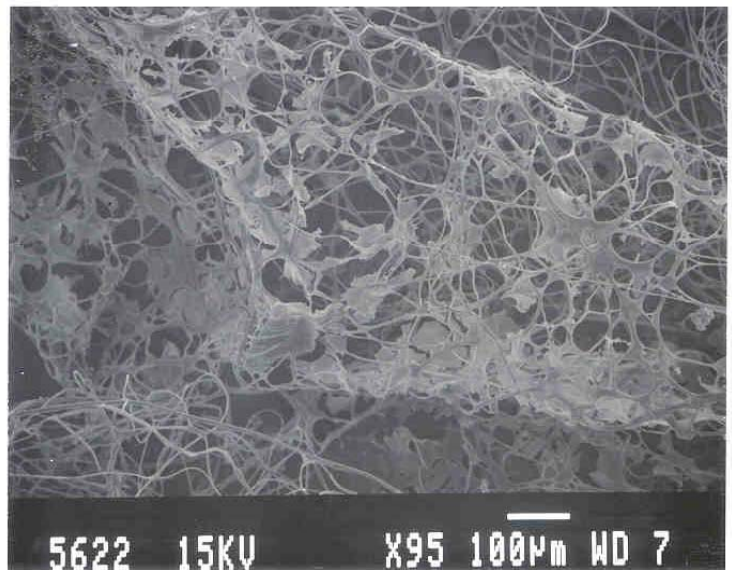


15%



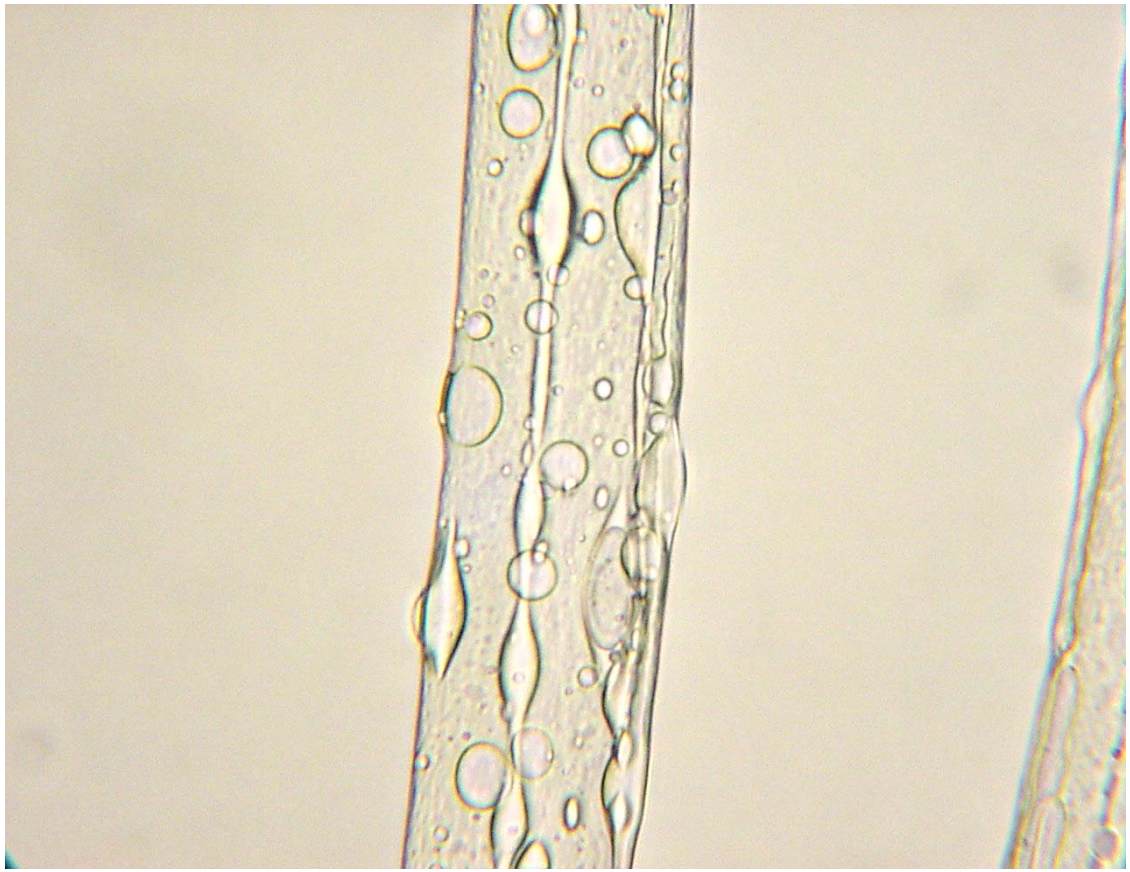
20%

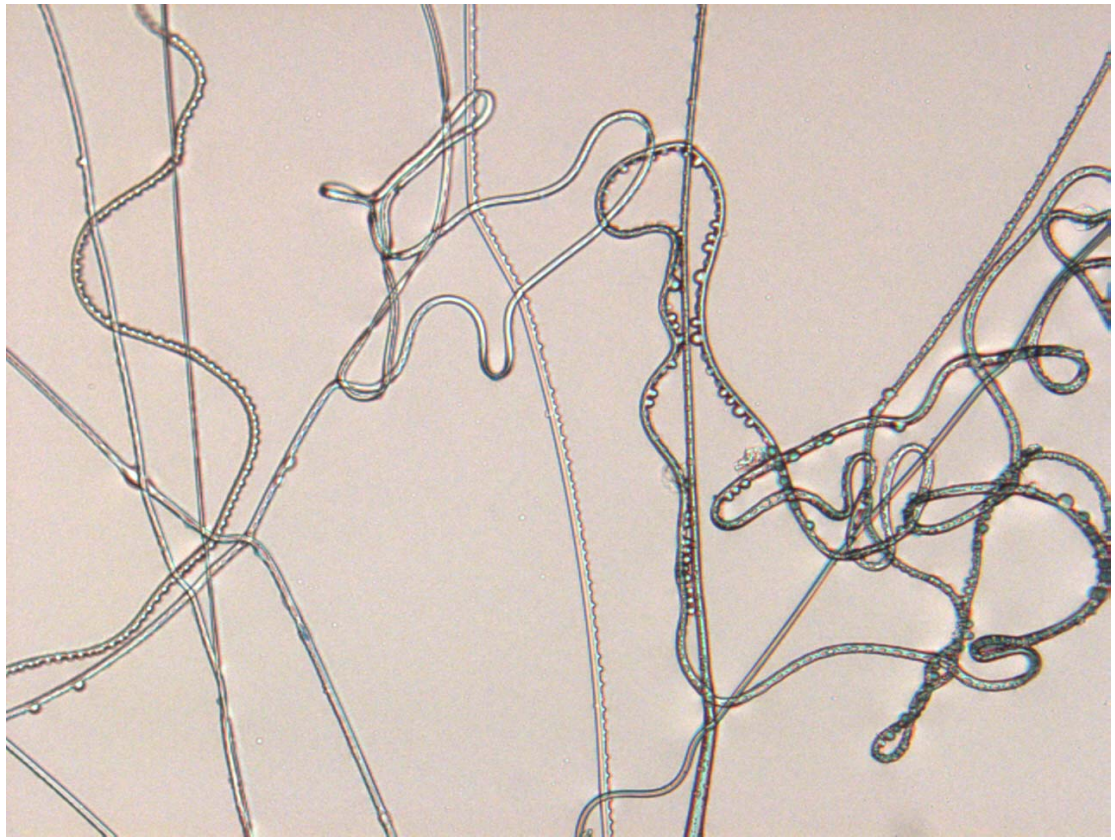


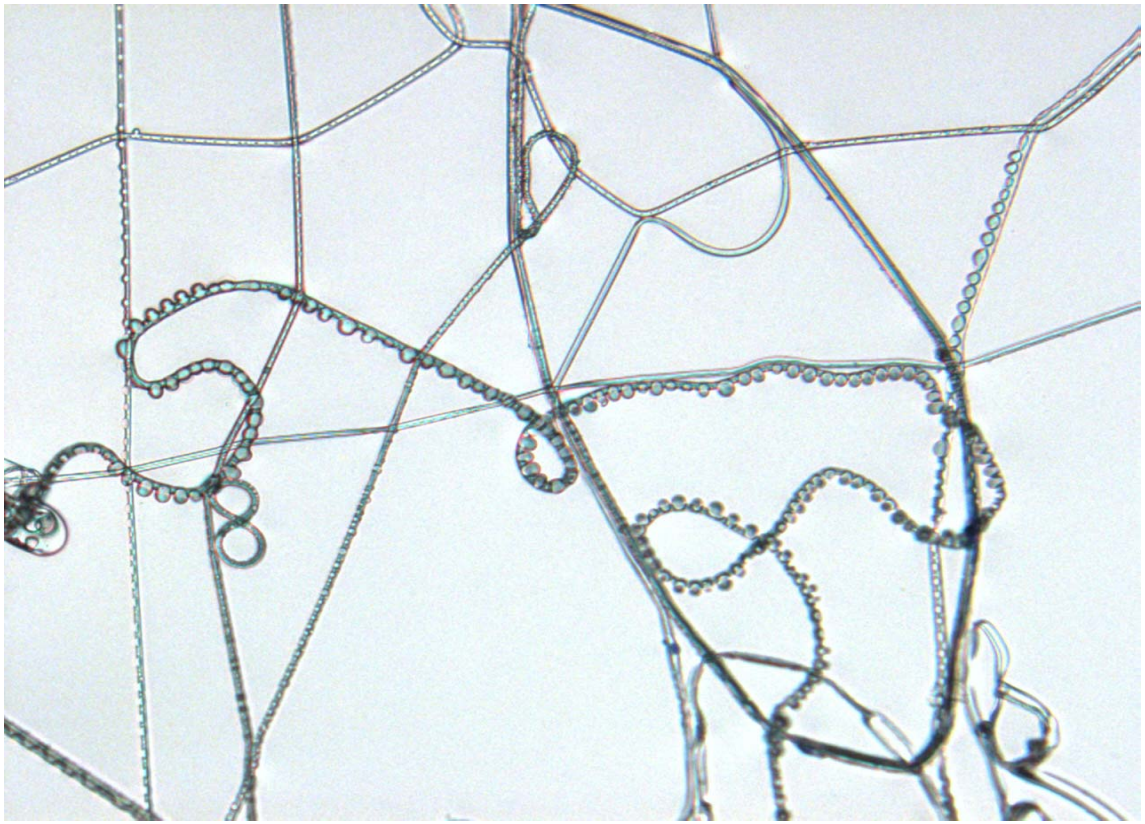


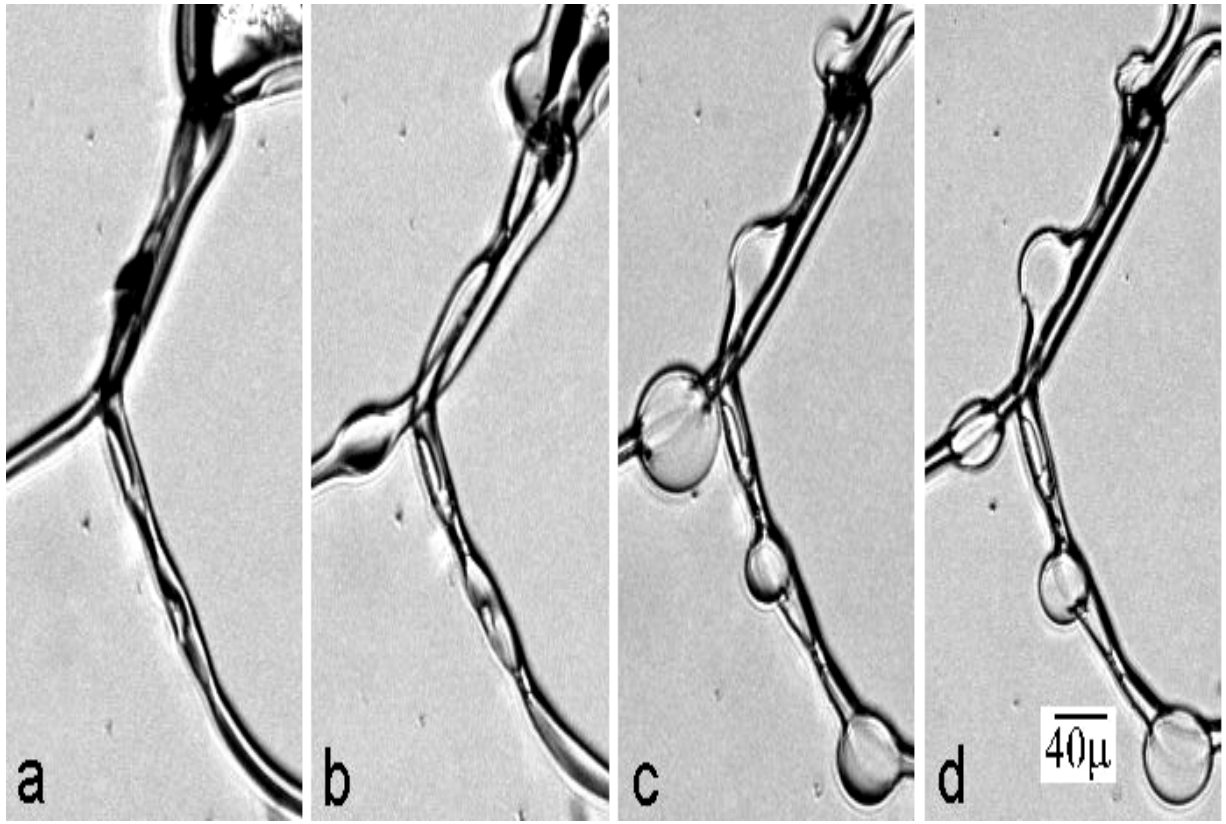
Fibroblast cells interacting with the EVOH mat after 7 days in culture.

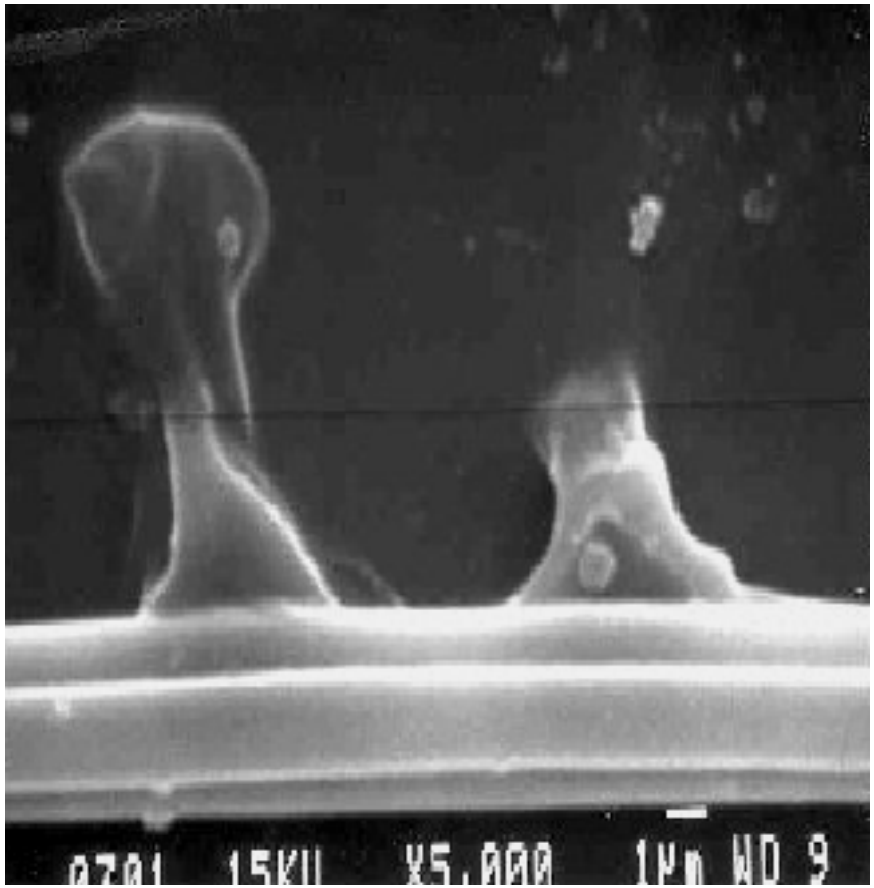
Kenawy et al., *Biomaterials*, **24**, 907-913 (2003)



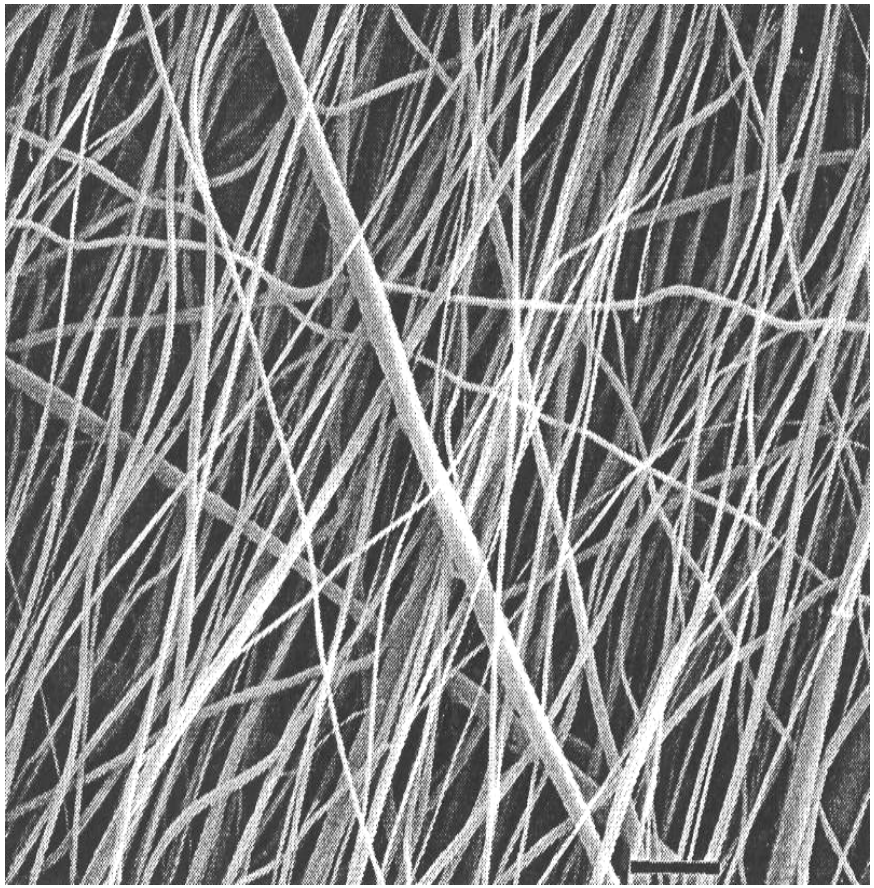


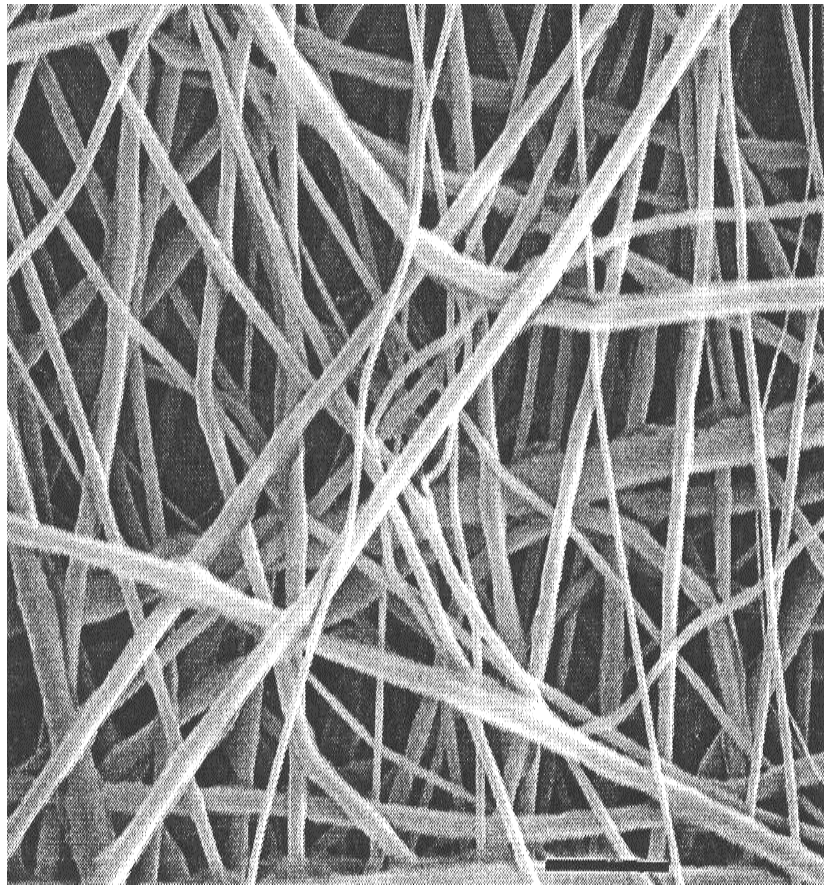


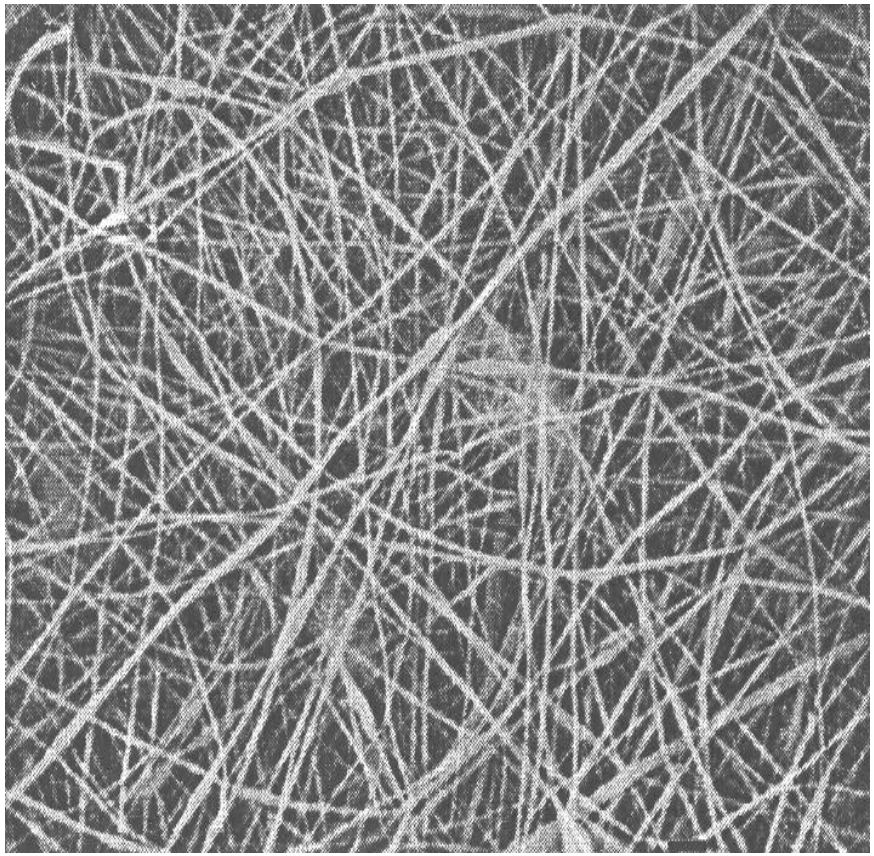

a
b
c
d
40μ

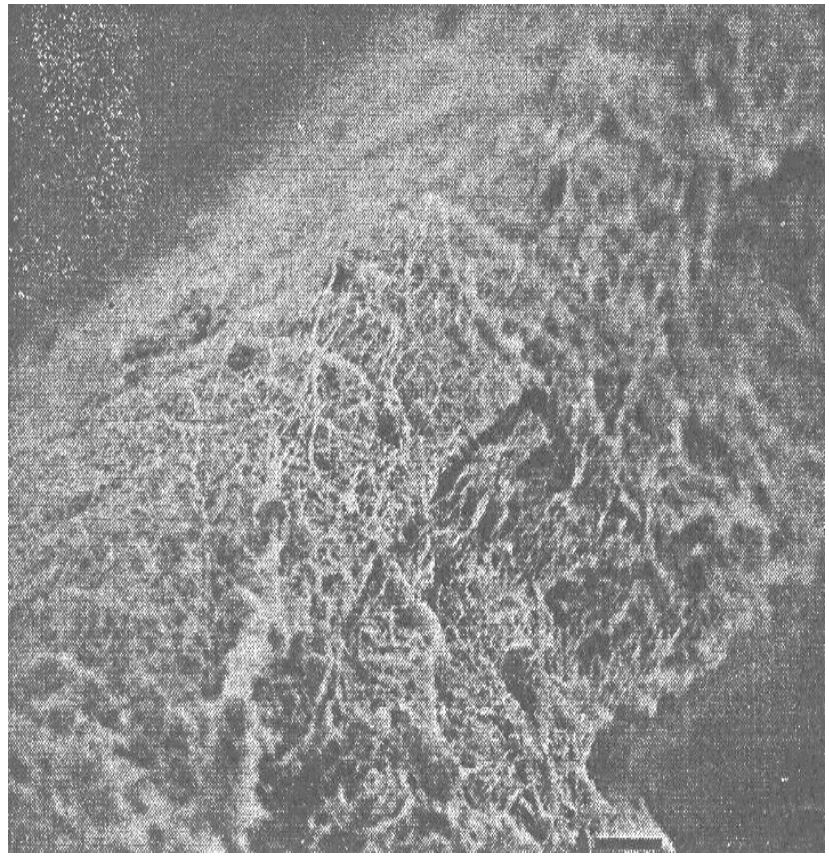

0701 15KU X5,000 1Um WD 9

0700 15KU X2,500 10Um WD 9





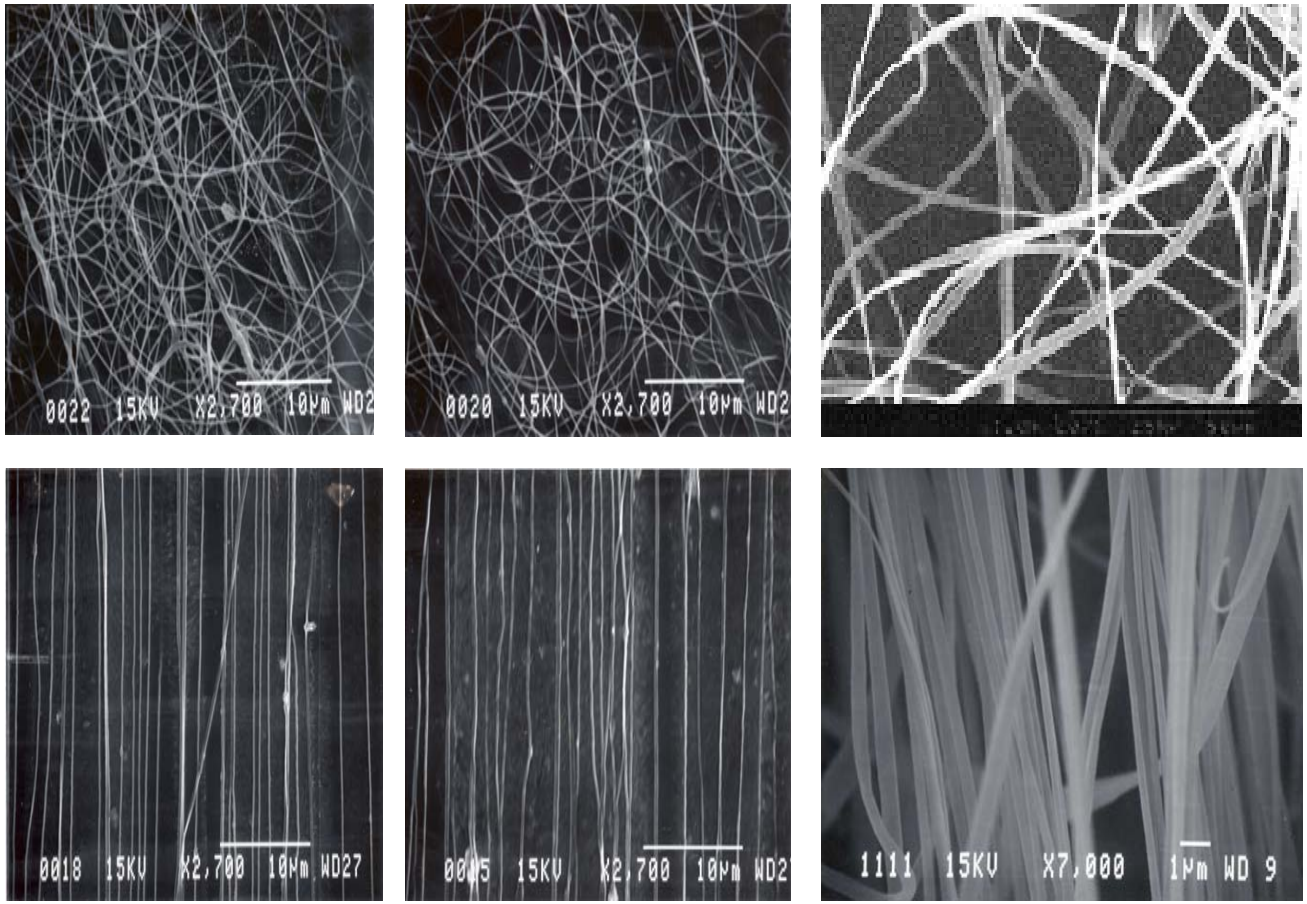




Electrospun Polymer Fibers

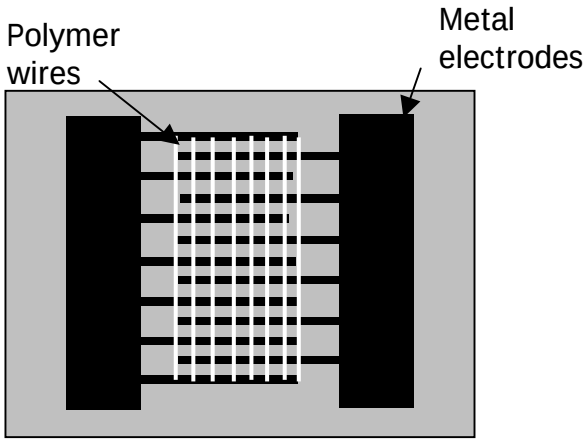
DC

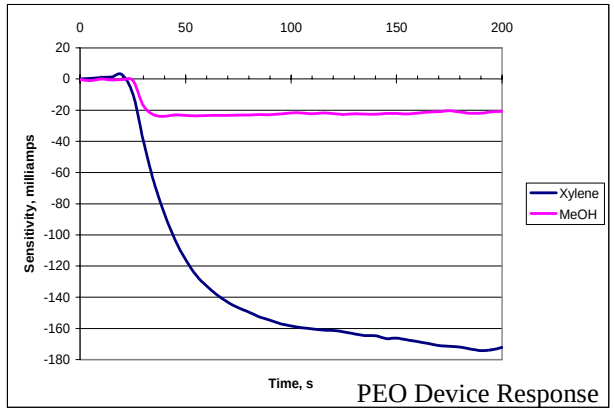
AC



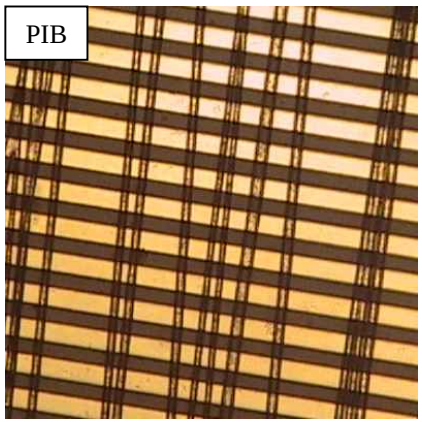
PEO PEO/SWCNT Cellulose Acetate

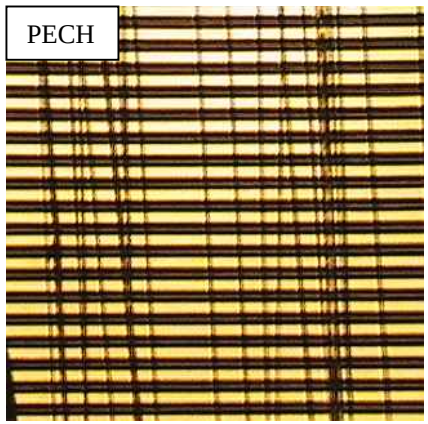
Electrospun Chemiresistor Sensor Chips



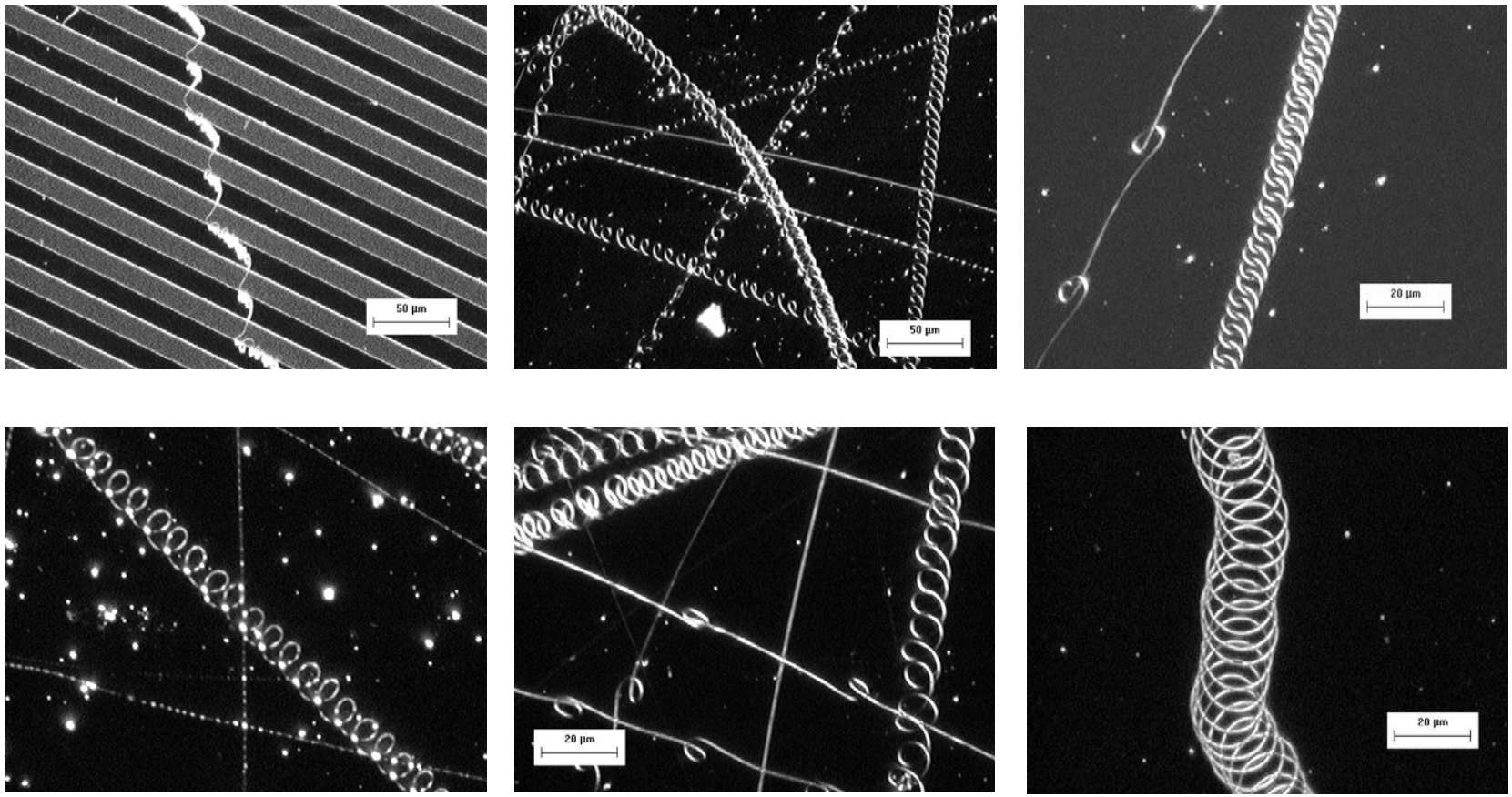


PEO Device Response





Polymer/Carbon Black microfibers on an interdigitated microelectrode

Electrospun Microsprings

PEO-PASA composite fibers