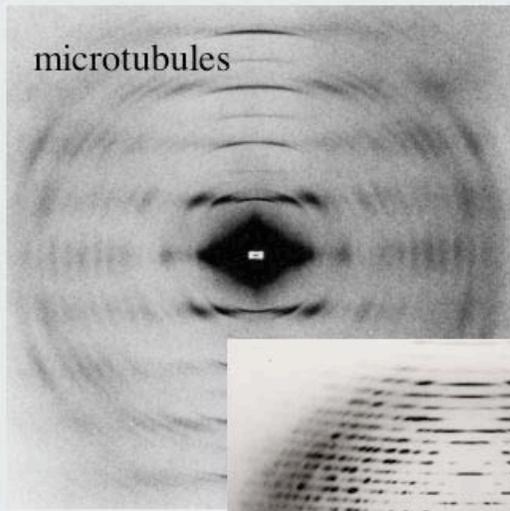
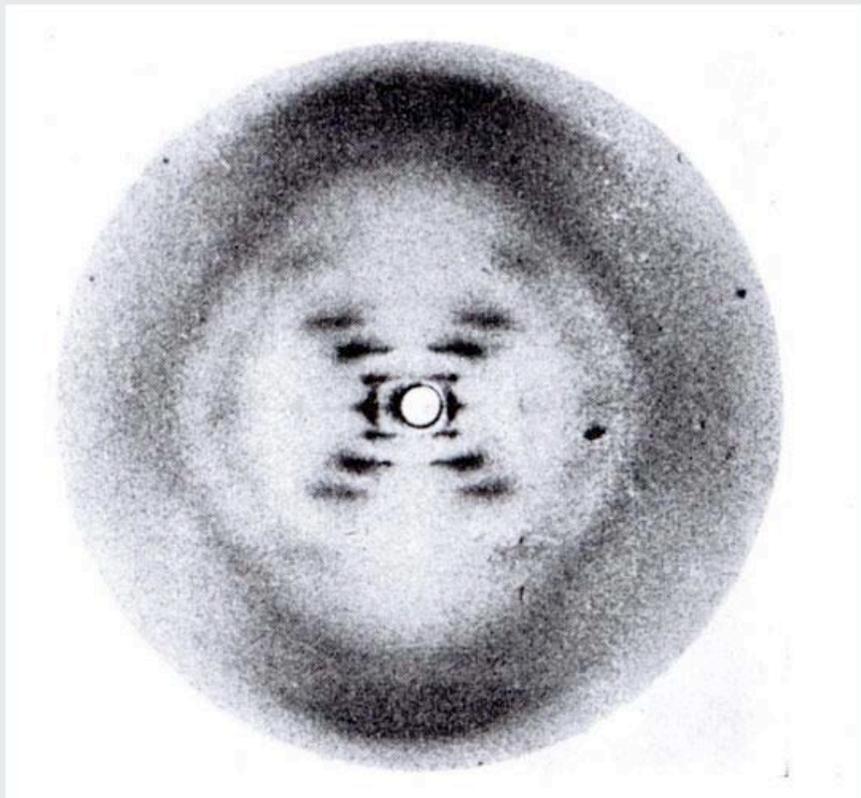


Fiber diffraction in biology: new opportunities from neutron scattering

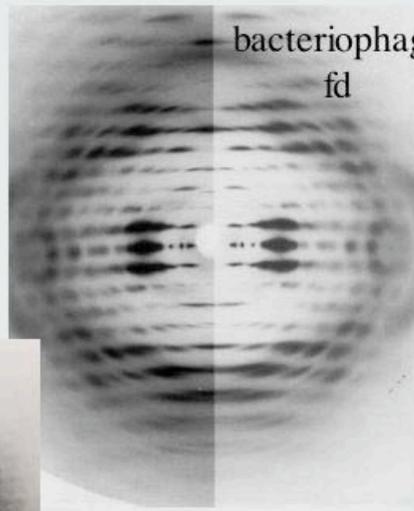
*Gerald Stubbs
Vanderbilt University*

Thus you can see why a very successful practitioner in this field, who may prefer to remain nameless, said, “Fiber diffraction is not what you’d do if you had a choice.” Sometimes it is simply the only way to get structural information from diffraction.

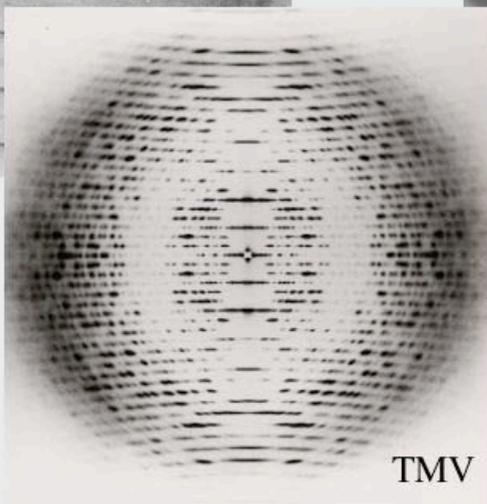
Gale Rhodes, *Crystallography made crystal clear* 2nd edn. (Academic Press, 2000)



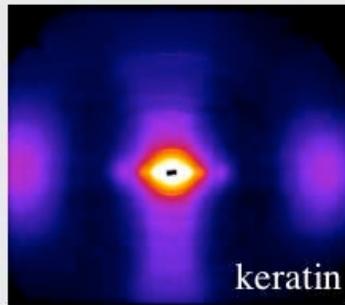
microtubules



bacteriophage
fd



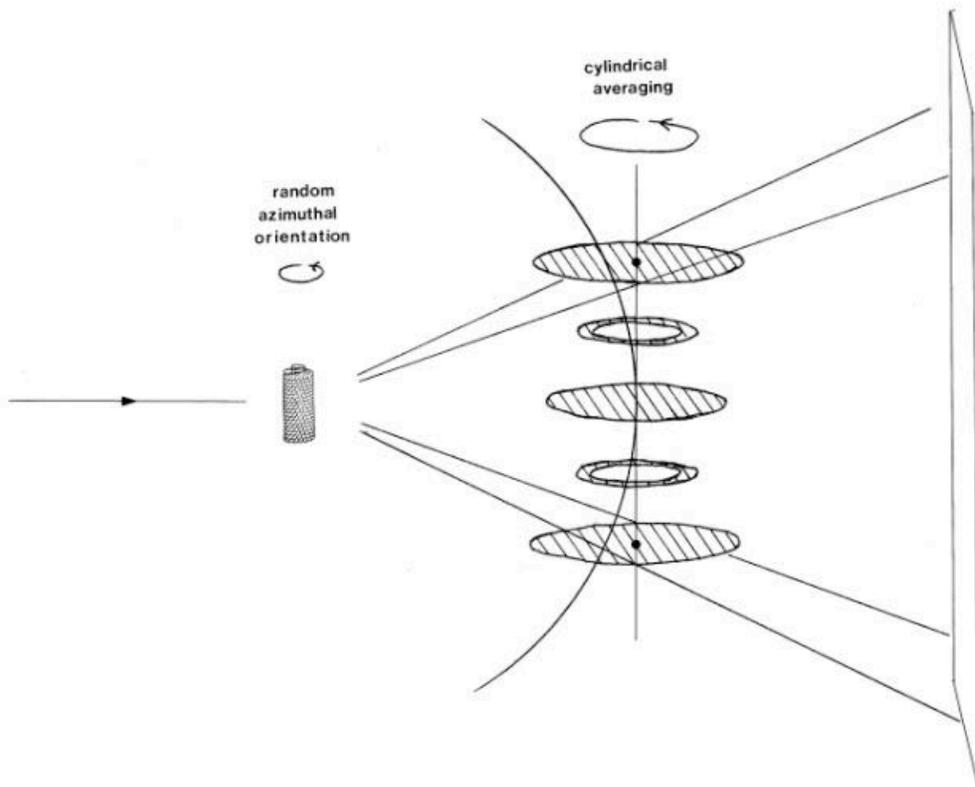
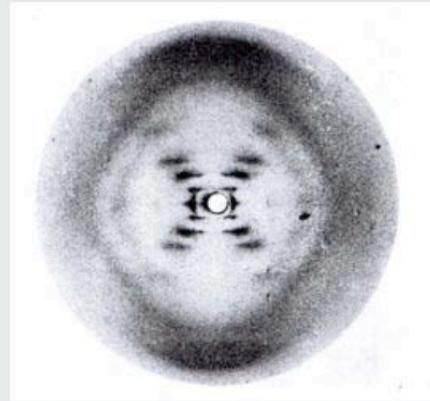
TMV



keratin

X-ray fiber
diffraction
patterns

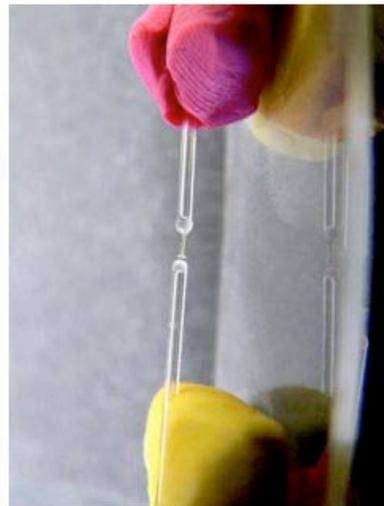
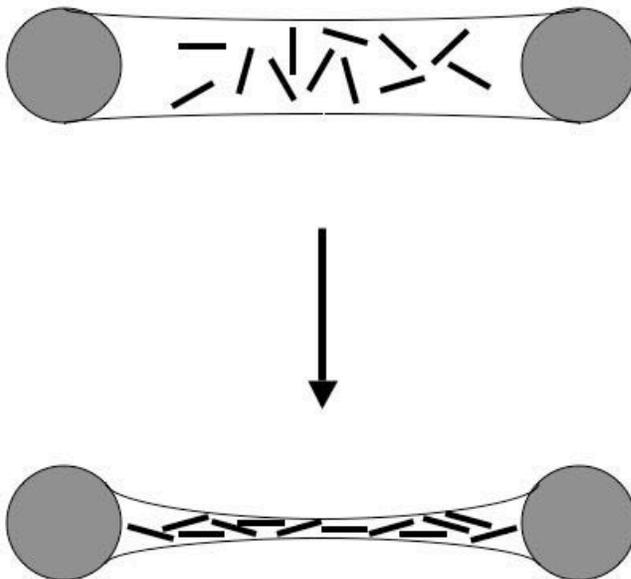
Fiber diffraction patterns can show the helical pitch and axial rise per subunit very directly.



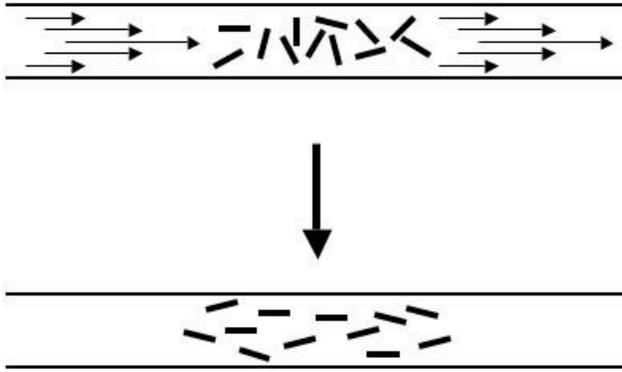
Data lost as a result of cylindrical averaging in fiber diffraction

	TMV	Pf1
7 Å	23%	2%
3 Å	61%	41%

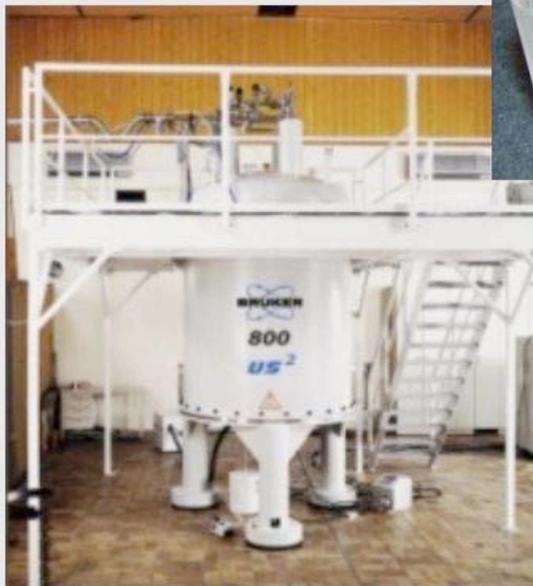
from Makowski (1982). *J. Appl. Cryst.* **15**, 546-547



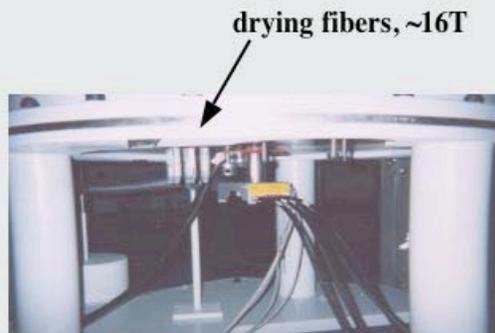
Drying orients filaments by volume exclusion and surface tension effects.



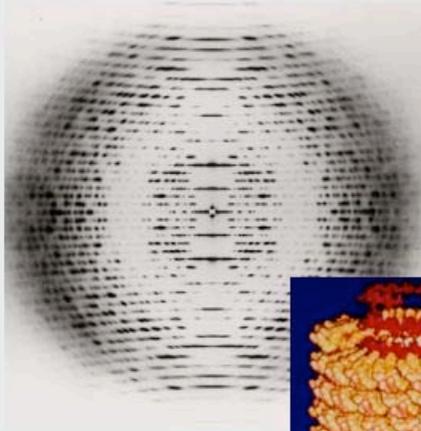
Shearing forces orient filaments.



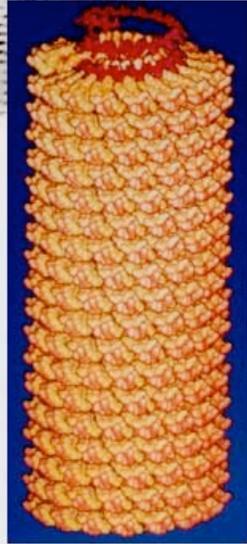
adaptor for orienting sols



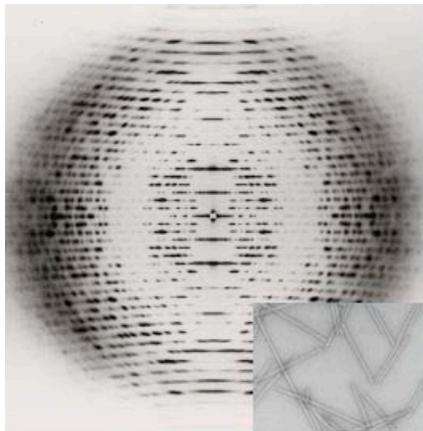
800 MHz NMR magnet: 18.8 Tesla



Tobacco mosaic virus (Vanderbilt)

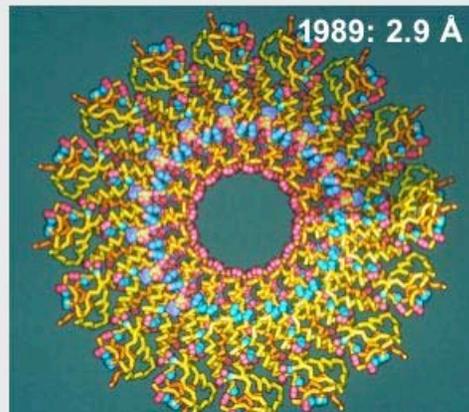
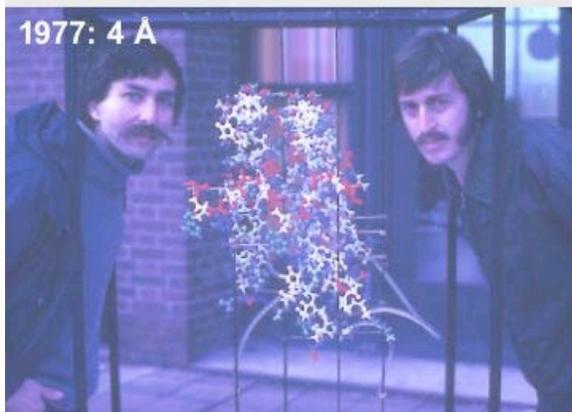
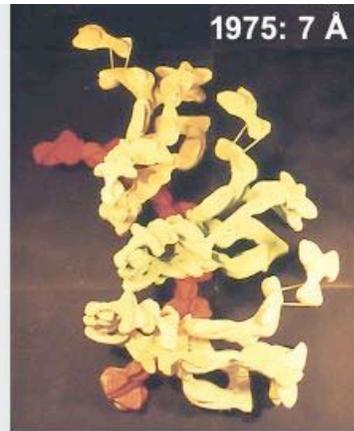


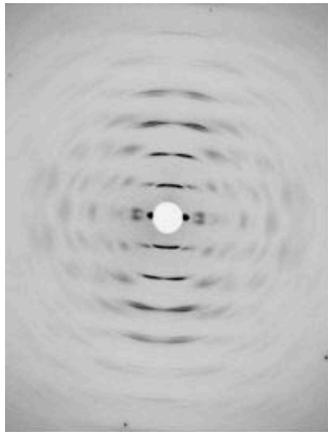
Bacterial flagella (Keiichi Namba, Osaka)



tobacco mosaic virus: 1936 -1989

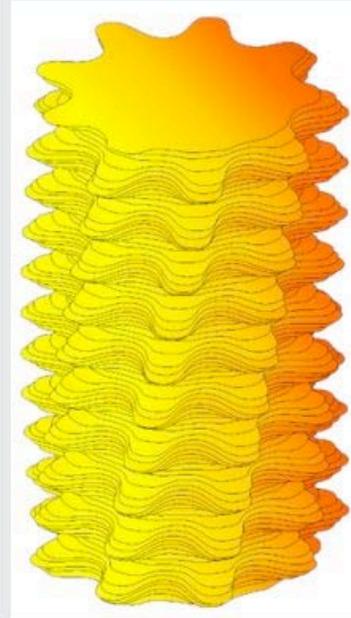
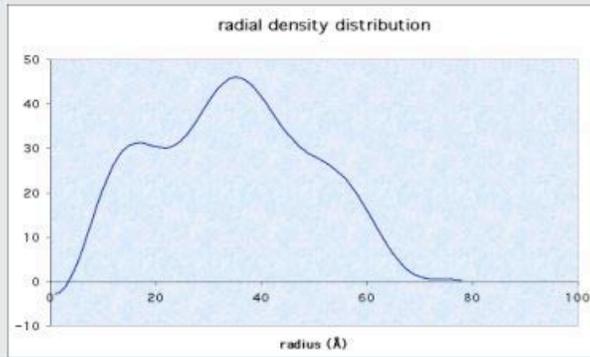
(TMV-U2 1992, cucumber green mottle mosaic virus 1994, ribgrass mosaic virus 1997, odontoglossum ringspot virus in progress)



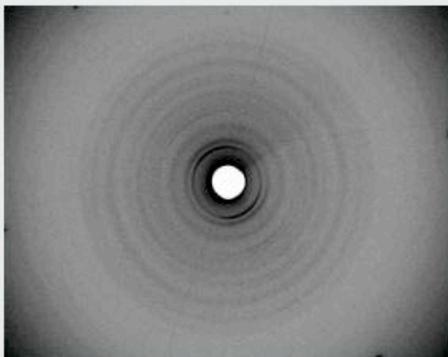


potato virus X: 2002 and in progress

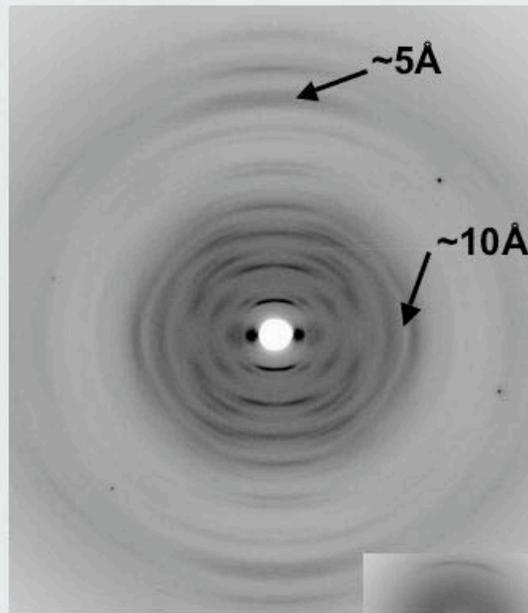
(also narcissus mosaic virus
and others)



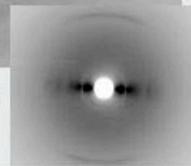
PVY, 1977 (optical diffraction)
McDonald and Bancroft, *J. Gen. Virol.* 35, 251



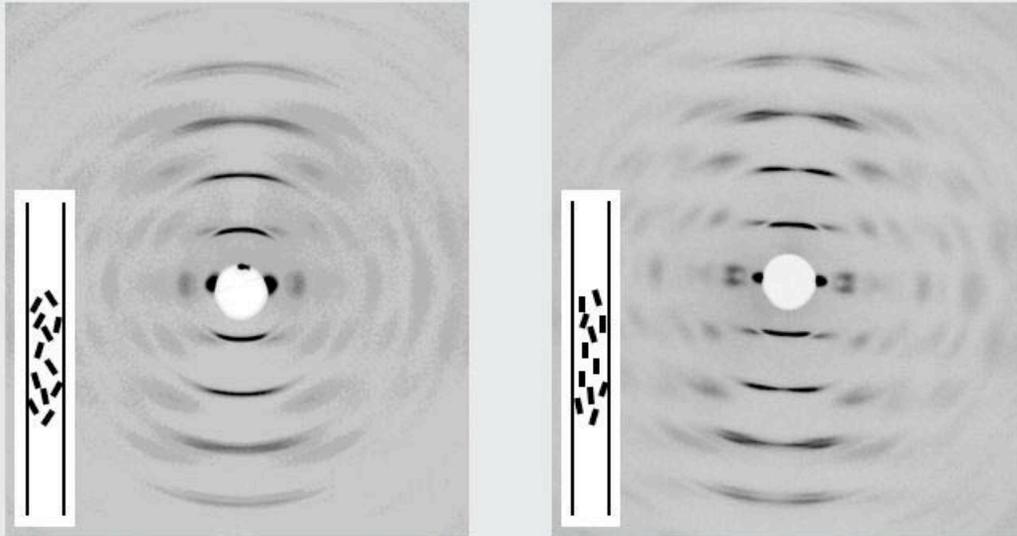
WSMV, 2003



BCMNV, June 2005



Diffraction from potyvirus



Diffraction from potato virus X sols differing in specimen disorientation

Disorientation causes intensities to overlap, limiting resolution even when diffraction extends to higher resolution.

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NSF MCB-0235653 (filamentous viruses)
NSF MCB-0234001 (RCN: Fiber Diffraction from
Biological Polymers and Assemblies, *FiberNet*)
USDA 2003-01178 (potyviruses)

FiberNet Fiber Diffraction Workshop
August 6 - 9, 2006, Fall Creek Falls, Tennessee
More information from the FiberNet web site
www.fiberdiffraction.org