William Astbury used X-ray crystallography to unravel the changeable structures of proteins.

MOLECULAR BIOLOGY

Of DNA and broken dreams

Georgina Ferry weighs up a life of William Astbury, who had a forgotten role in pinning down the double helix.

History is written by the victors, in science as in war. The story of the race to uncover the structure of DNA was thrust into the public imagination by James Watson's highly partial 1968 account, *The Double Helix*. Ever since, historians have been filling in the gaps. Most notably, successive authors have corrected

Watson's unkind portrait of Rosalind Franklin, whose X-ray-diffraction photograph of DNA ('Photo 51') was crucial to the model developed by Watson with Francis Crick.

Now science historian Kersten Hall has disinterred another figure from the footnotes of the DNA story, and brought him into the limelight. William Astbury — known to

all as Bill — was part of the group of X-ray crystallographers who learned their craft at the feet of William Henry Bragg, the father of the field, at London's Royal Institution in the 1920s. Astbury, along with fellow student J. D. Bernal, was fired with the new technique's possibilities for studying the key molecules of life, especially the proteins that are fundamental to all living tissue.

Bernal left the Royal Institution to found a lab at the University of Cambridge, UK; Astbury was banished (as he saw it at the time) to the University of Leeds in northern England. There he applied X-ray analysis to the study of natural fibres such as wool and hair: Leeds was an important centre of the textile industry. The wool protein keratin, Astbury complained on his appointment, was "lifeless and uninteresting". Later, he would tell public audiences that wool had given him "a glimpse of the loom on which the web of life is woven".

In the early 1930s, Astbury obtained X-ray-diffraction photographs of stretched and unstretched wool fibres, which suggested that the protein chain could switch between a compact and an extended form. Apart from shedding light on the elasticity of wool, his discovery showed that the properties of long-chain proteins depended on their three-dimensional shape, and that changes in shape could have functional consequences.

Hall makes a good case for Astbury's contribution to protein-structure analysis, but the book's subtitle signals that the author is really interested in DNA. In 1938, Astbury and his PhD student Florence Bell — a protégée of Bragg's son Lawrence, and now largely forgotten — published the first X-ray photographs of DNA fibres. They were blurred and hard to analyse, because the Leeds team did not know that two forms of DNA were mixed in their sample. But they contributed to Watson and Crick's thinking, and encouraged Maurice Wilkins — and subsequently Franklin — at King's College London to undertake X-ray studies of the molecule.

In 1951, Astbury's "lab boy" turned doctoral student, Elwyn Beighton, produced X-ray photos of DNA that were almost identical to Franklin's Photo 51, taken the following year. Astbury never published Beighton's pictures or presented them in public, nor did he seem to recognize that the distinctive X-shaped diffraction pattern showed that DNA was a helix.

Hall is clearly frustrated that Astbury missed the chance to win a Nobel Prize and

The Man in the Monkeynut Coat: William Astbury and the Forgotten Road to the Double-Helix
KERSTEN T. HALL
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change the face of biology. He dwells at length on what might account for this failure. Astbury had become depressed and embittered as he saw others in London and Cambridge win funding that he had failed to secure. He had conceded the DNA problem to Wilkins at King's. He may not have kept up with the theory of X-ray diffraction. Finally, Hall suggests, Astbury probably saw DNA's apparently fixed structure as uninteresting compared to the conformational changes in proteins; at the time, his main interest (and the subject of Beighton's thesis) was bacterial flagella.

Hall indulges in some counterfactual speculation. What if Astbury had shown Beighton's pictures to the US chemist — and later Nobel laureate — Linus Pauling, who stayed with Astbury in Leeds in 1952? Pauling might have seen their significance and realized Watson and Crick's worst fears by beating them to the structure. But it didn't happen, and Watson's 1968 book credits Astbury only with the “one half-good photograph” taken by Bell in 1938.

Hall tells his story with style and pace. But I am unconvinced by his central contention, that Astbury was a “titan” and the founder of molecular biology. Astbury was one of many who independently promoted a molecular approach to understanding living things. Success in science depends as much on personality as on intellect, and here Hall leaves us largely in the dark. Clearly Astbury was a larger-than-life figure, a good communicator and entertaining in company (if you liked “off-colour jokes”), yet not favoured by the scientific establishment. Crystallography pioneer Dorothy Hodgkin (who taught chemistry to Astbury's daughter Maureen at the University of Oxford, UK — a connection not mentioned by Hall) once described him affectionately as “very bad and very amusing”.

And the monkeynut coat? Astbury worked with the now defunct UK company Imperial Chemical Industries to develop fibres made from a protein derived from peanuts, and proudly wore a coat made from ‘Ardil’. It proved to be no cheaper and considerably less hard-wearing than wool, and never took off. Hall uses this story to launch a final chapter exploring Astbury's prescient reflections on the manipulation of biological materials for utilitarian ends. He did not live to see the age of biotechnology, but he was certainly one of its prophets. ■

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Books in brief

Do Fathers Matter?: What Science Is Telling Us About the Parent We've Overlooked

Paul Raeburn FARRAR, STRAUS & GIROUX (2014)

When science journalist Paul Raeburn first assessed the available research on fathers, he found the pickings decidedly slim. Scientists are now redressing the balance, and Raeburn has rounded up key findings in developmental psychology, evolutionary biology, genetics and neuroscience. Prepare for a bracing walk through the myriad ways fathers matter, from the “genomic battle of the sexes” that can lead to differing syndromes in offspring, to a father's ‘destabilizing’ — and hence stimulating and educative — play with his children.

The Island of Knowledge: The Limits of Science and the Search for Meaning

Marcelo Gleiser BASIC BOOKS (2014)

Among the bright knowns of science are countless unknowns, untouched by the most exquisitely calibrated, powerful instruments yet invented. Physicist Marcelo Gleiser sets out to explore the extent to which we can make sense of reality. He maps humanity's “island of knowledge” from pre-Socratic cosmology to quantum mechanics. And he marks how mysteries proliferate with each finding — a perpetual blur in our cosmic view that, like mathematician Kurt Gödel's work on incompleteness, spurs scientific creativity.

The Consolations of Economics: How We Will All Benefit from the New World Order

Gerard Lyons FABER AND FABER (2014)

The economic conflagration of 2008 inspired plenty of bravura ideas on how to fireproof the future. Economist Gerard Lyons, who saw it all coming, offers a gloom-free reading of causes and correctives, and predicts global growth led by multiple economies. Drawing on key case studies and long experience with China, he examines world economic drivers, ‘soft’ and ‘hard’ power (a country's influence exerted through cultural appeal, or by military or economic means), and the economic goals and strategies that foster global stability.

Gotham Unbound: The Ecological History of Greater New York

Ted Steinberg SIMON & SCHUSTER (2014)

How did Mannahatta, a wild expanse of hills and mudflats on North America's Atlantic coast, become the high-density, concrete-coated city of New York? Ted Steinberg's environmental history traces the stages from Henry Hudson's 1609 discovery of a “drowned estuary” to the ravages of Hurricane Sandy in 2012. Centuries of extreme land-use changes — reclaiming underwater terrain, levelling hills, draining lakes and crafting ersatz terra firma from landfill — have created an ecologically scarred city vulnerable to further storms. Other coastal megacities should take heed.

Human Evolution: A Pelican Introduction

Robin Dunbar PELICAN BOOKS (2014)

The British Academy's ‘Lucy to Language’ project has spawned major sociobiological findings, most recently aired in *Thinking Big* by Robin Dunbar, Clive Gamble and John Gowlett (see *Nature* **509**, 284–285; 2014). Dunbar draws on that research — in particular the social-brain hypothesis and time-budget models — for this solid primer on human evolution under the relaunched Pelican imprint. On the journey from the australopithecines to the Neolithic and what followed, Dunbar is an accomplished guide. *Barbara Kiser*