

## Jimmy Mac

### DNA: The Secret of Life

By James D. Watson, Andrew Berry (contributor)

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In a rare flash of self-analysis, James D. Watson told an interviewer that in a film version of *The Double Helix*, "I should be played by John McEnroe... You know, someone who pisses people off." (full text of the interview is available at <http://www.randomhouse.com/boldtype/0202/watson/interview.html>). Not immodest, considering that Watson has won a number of Grand Slams in science: he's solved the structure of DNA, written a classic memoir of the solution, posed the riddle of RNA, mentored the Human Genome Project and built a small Long Island laboratory into a world center of molecular science. Watson's new book, *DNA: The Secret of Life* is also at Grand Slam level; a performance worthy of Johnny Mac, it's a deft display of science writing by a top-seeded scientist. It's also guaranteed to piss off the politically correct, the fans of revealed religion and eco-sentimentalists of any stripe.

Issued on the fiftieth anniversary of the discovery of the three-dimensional structure of DNA, the book succeeds on three levels at once. It offers the general public a blueprint of molecular genetics from sweet peas to stem cells; it reminds those who grew up with the biological revolution of its history; and finally, it presents an eloquent and necessary argument for reductionist science:

"The discovery of DNA put an end to a debate as old as the human species: Does life have some magical, mystical essence, or is it, like any chemical reaction carried out in a science class, the product of normal physical and chemical processes? Is there something divine at the heart of a cell that brings it to life? The double helix answered that question with a definitive No."

Readers of this journal will not have to be reminded of the facts of twentieth-

century molecular biology; suffice it to say that the man who assembled its first professional text, *The Molecular Biology of the Gene* (1965), has provided an updated, well-illustrated primer of modern cell and molecular biology for the general reader. What's in it for us, then? A family album, laced with telling anecdotes and neat arguments for "value-free science." Watson's plea for the unbiased study of behavioral genetics, for example, is not irrelevant to self-censorship in scientific journals today:

"Let us not allow transient political considerations to set the scientific agenda. Yes, we may uncover truths that make us uneasy in the light of our present circumstances, but it is those circumstances, not nature's truth, to which policy makers ought to address themselves."

Watson's book begins with a general survey of pre-DNA genetics; his quick run-through of work from Mendel to Morgan detours long enough for a tough analysis of the eugenics movement. First professed in Anglo-Saxon lands by social Darwinists (for example, Charles Davenport, the first director at Cold Spring Harbor), eugenics flourished under Fascism and ended in Auschwitz. Meliorists and Fabians, on the other hand, hoped to cleanse the gene pool by tidy breeding based on tight statistics. Watson reminds us that Francis Galton, Darwin's cousin, disproved the notion that prayer could prevail over genes. Despite centuries of Sunday prayers for the monarchs of Britain, the cumulative effect of all those prayers was not beneficial: "On average the monarchs died somewhat younger than other members of the British aristocracy."

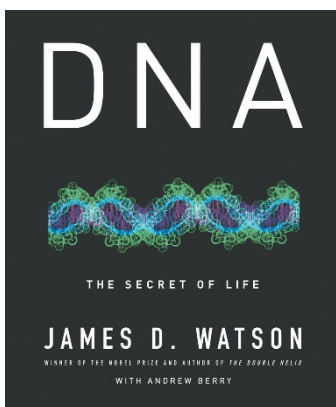
Watson's treatment here of other contributors to DNA science is more even-handed than in his jejune memoirs *The Double Helix* and *Genes, Girls and Gamow*. We learn that genetics became chemistry

thanks to J. F. Miescher's isolation of nuclein from pus (1871) but that DNA didn't become 'the secret of life' until Oswald Avery, Colin McCleod and Maclyn McCarty transformed pneumococci with pure DNA in 1944. By 1953, with A-T, G-C base ratios established (Erwin Chargaff), with crystallographic patterns of dry and wet DNA available at a glance (Rosalind Franklin, Maurice Wilkins) and with enol-ketone tautomers to explain base pairing (Jerry Donohue), Watson and Crick did the thought experiment of the century. On the last day of February in 1953, Francis Crick announced to one and all at the Eagle pub in Benét Street in Cambridge that "we have discovered the secret of life." A plaque proclaiming the event is promised (see <http://www2.mrc-lmb.cam.ac.uk/dna2003/update.html> for more information). *DNA: The Secret of Life* pays tribute grander than any plaque to the many "we's" who made and extended the discovery.

One might, of course, argue that there are many 'secrets of life.' If life is just a matter of physics and chemistry, what about the physics and chemistry of how mitochondria trap energy from the sun using ATP (Peter Mitchell, John Walker), of how amphipathic lipids trapped organic molecules from the primal soup (Alec Bangham) or how  $n\lambda = 2d\sin\theta$  (the Bragg equation) permits crystallographers to decipher matter? Each of these secrets also popped up by the river Cam.

Watson swings into high anecdotal gear with his story of what happened to DNA after 1953. The family album yields snapshots and cameo biographies aplenty—100 graphics and photos, to be exact. The first plate (1953) shows Watson with Crick posing for a *Varsity* photographer beside the canonical DNA model. Watson is in a new outfit picked by Odile Crick off the racks at a Trinity Street shop: blazer and flannels that "would much better express (*sic*) my new status as the co-winner of a very great scientific jackpot." (from *Genes, Girls and Gamow*). The last shows transgenic mice to bolster Watson's argument that genes can determine social behavior. Insel and Young at Emory (2001) had inserted the vasopressin gene from uxorious prairie voles into promiscuous wild-type mice. They found that the transgenic mice became "tenderly solicitous" of the female. Watson reports that the procedure "did seem to make the affected mouse less of a rat."

In between, we are treated to snaps of a young Matt Meselson at the ultracentrifuge as he and Frank Stahl carried out the "most beautiful experiment in biology" to find the semi-conservative replication of DNA:



“They met in the summer of 1954 at the Marine Biological Laboratory at Woods Hole, Massachusetts, where I was then lecturing [in the Physiology Course], and agreed—over a good many gin martinis—that they should get together to do some science.”

We flick through the album to Jacob, Monod and Lwoff, to the adolescent antics of the RNA tie-club (Alex Rich, Sidney Brenner, Leslie Orgel, Francis Crick, George Gamow *et al.*) and to the ever-young Arthur Kornberg, “the first to ‘make life’ in the test tube” using DNA polymerase and ligase. Ahead are the dons of gene splicing, Stanley Cohen and Herb Boyer (from *Time* magazine’s cover in 1981); ahead also is that famous picture of Bill Clinton with Craig Venter and Francis Collins at Center Court (Washington) in June of 2000 to announce the winner(s) of the human genome tournament. Claire Fraser of The Institute for Genome Research appears solo a few pages later, closer to Barbara Mc Clintock and maize than to human genes. Watson is displeased by the privatization of genes without gene products, accusing The Institute

for Genome Research and William Haseltine’s Human Genome Sciences of being “simply the biotech equivalent of the kids who round up all the toys at the playground just so no other kid can play with them.”

The last half of the book addresses broader issues posed by genetic science: the promise and fears of ‘playing God’ in biotechnology, the new population genetics of Cavalli-Sforza (we did, indeed, come out of Africa) and the threats to our ecosystems that sentimentalists assure the public will follow genetically modified (GM) foods.

“Let me be utterly plain in stating my belief that it is nothing less than an absurdity to deprive ourselves of the benefits of GM foods by demonizing them; and, with the need for them so great in the developing world, it is nothing less than a crime to be governed by the irrational suppositions of Prince Charles and others.”

As coach of the public consortium, Watson is pleased that humans turn out to have far fewer genes than first supposed.

True to his reductionist belief, he dissents from Stephen Jay Gould’s notion that fewer genes imply a holistic superstructure: “emergent qualities.” Watson argues that it’s easier to sort through the chemistry and physics of 35,000 than 100,000 genes:

“Life, we now know, is nothing but a vast array of coordinated chemical reactions. The ‘secret’ to that coordination is the breathtakingly complex set of instructions inscribed, again chemically, in our DNA.”

Watson has written a fine book, the epigraph to which might have been written by Jacques Loeb, another legendary instructor in the Woods Hole Physiology course. Loeb, who was the first to create life in a dish (parthenogenetic sea urchin larvae; *Science* **11**, 612–614, 1900) argued in 1912 that “life, i.e. the sum of all life phenomena, can be unequivocally explained in physico-chemical terms.” (in *The Mechanistic Conception of Life*). That’s also a secret of life, but one based on guesswork rather than DNA, in those days before the tie-breaker. □