Darwin and Inheritance

Darwinism Meets Mendelian Genetics

STEVE JONES:
I think science is basically the art of classifying the world and with more or less sophistication that's what it does, it tries to make order out of what seems like disorder and nowhere is that more true in, than in biology. There are millions and millions of different kinds of creatures around and it's a perfectly natural human instinct, like stamp collecting, to put them into categories. The Swedish biologist Linnaeus had come up with a mechanism for classifying them which was basically completely arbitrary, it was a two stage mechanism, you put them into large groups called genre and smaller groups called species and it worked pretty well. However, what very quickly became obvious, and it was obvious to Darwin, that this wasn't like stamp collecting, you've got the one and thrupenny tristan lacuniour 1952 black or you don't, there are no intermediates. In evolution there are intermediates and that really is what concentrated Darwin's mind most of all. If life is classified why isn't it easily classified, why are the edges blurred? And he came to the idea that maybe the edges are blurred because species aren't absolute they can change from one into the next.

PETER CAPALDI:
But these variations, the blurring at the edges between one individual and another, seemed to be made up of subtle differences - slight variations in the size of the head, colour, or shape of a wing. These seemingly continuous variations were very much at odds with the discrete changes that Mendel had observed. But Darwin was himself a great observer. He knew that the extraordinary variety that pigeon fanciers produced had all been achieved gradually - breeders selecting the birds they wanted to mate together by paying detailed attention to the characteristics they wanted to emphasise - culling those in which those features were less developed. This rather draconian artificial selection acting to nudge these creatures on to yet more fantastic forms. But how? What was the mechanism? Careful measurements of variations between parents and offspring showed slight changes, changes that you could trace through the generations - so it's not difficult to see why he began to think of inheritance as a sort of blending of different characteristics, nor is it difficult to see the problems inherent in the idea.

JOHN MAYNARD SMITH:
If it were the case that heredity really was a kind of mixing of two fluids, so the offspring was always exactly intermediate between the parents as far as its genetic constitution is concerned, then it's fairly easy to see that the result of continuous interbreeding is that everybody becomes alike, then you can't have evolution and Darwin when he realised this was I think pretty disturbed about it

STEVE JONES:
What Mendel showed was that the genetic instructions are separate from what they make. And what we do to ourselves in terms of let's say sawing our feet off or being circumcised or whatever you like, makes no difference to the genes so that separation of agent and product is what was central to Mendel's work. And Darwin had never really grasped that, he always thought that the attributes to the animals themselves, their bodies, their thoughts, their habits were passed onto the next generation. That isn't true their genes are.

PETER CAPALDI:
So whatever it is that specifies a feature of a living thing remains, in some way, distinct, separate from what gets made - sometimes appearing in one generation, sometimes not to be seen for several to come. Add to this the occasional mutation that might produce some useful attribute and you have a reasonable account of how species vary, change and develop.

When the full significance of this sunk in, it seemed that all Darwin's speculation about competition and natural selection had been fruitless. Couldn't evolutionary change be better explained by Mendelian genetics?

STEVEN ROSE:
It took really from about the turn of the century until the great synthesis of Darwinism and Mendel in the 1930's, to try to understand how you could relate the two, and what the new synthesis did, the modern synthesis did in the 1930's what it showed I think fundamentally that Mendelian genetics could provide the basis for evolutionary change.

PETER CAPALDI:
The key to the modern synthesis lay in the realisation that genes actually worked in very complex ways. For although Mendel had deliberately worked with simple characteristics - the colour of the pea flower, or the shape of its seeds - he knew that this convenient simplification would become more difficult as we tried to understand laws of inheritance more widely.

COLIN TUDGE:
The key to the answer to it, is in fact in Mendel's paper, that most characters actually involve lots and lots and lots of genes, they are in fact polygenic, and you can add another little complication to that that most genes, actually have more than one affect, in other words they are plyotropic, and if you say that a human being has a hundred thousand genes, and that god knows how many characters as many as you care to count, then you can see that in real life the complexities are enormous, and in real life you can get gradual changes just as Darwin said.

STEVE JONES:
I think our current understanding of inheritance to put it rather flippantly is that Mendel was right. But life in fact is much more complicated than that, nobody denies the basic fact of Mendelism and the great triumph of molecular biology is to turn the sort of intellectual construct of Mendel about these particles and he had no interest in what they were and where they might be found, to turn that into a real and rather tedious chemical called DNA.