2n = 46

The Human Chromosome Count

BioUpdate Foundation

When scientists realised that they had the technology to sequence entire genomes, the human genome was one of the very first on the list. Arguably, because to us, it is the most important genome to understand. By contrast, when it came to establishing the number of chromosomes each species had, the human chromosome count was one of the last to be established. It wasn't until early 1956 that the definitive count was published (J.H Tjio and A Levan, 1956, Hereditas 42: 1-6).

Although there are some minor disagreements over the fine details, there is little doubt over the course of events. For a fuller history read U. Arnason, Hereditas 143: 202-211 (2006) but the difficulty lay in making a good preparation in which the chromosomes were clearly visible. The most influential paper had been by van Winiwarter as far back as 1912 (Arch. Biol. 27: 91-189). He concluded that for human females 2n = 48 and for males 2n = 47. Following the work of Wieman (Am. J. Anat. 21: 1-21 [1917]) and Painter (Science, 53: 503-504 [1921]) on the Y chromosome, it became generally accepted that 2n = 48.

The problem of good preparations persisted until 1955. In 1955, Joe Hin Tjio was visiting Albert Levan's laboratory at the Institute of Genetics, University of Lund, and working with Levan finally succeeded in solving the problem. The human chromosome count was 46, 2n = 46.

As a student, I heard slightly different account, which does not take the credit away from Tjio and Levan, but adds a twist of technology and human behaviour. Imagine you are looking down a microscope, trying to count the number of chromosomes in a less than perfect preparation. Renowned scientists had established 2n = 48, and this was universally accepted. If you could see only 46, would you challenge the establishment or blame the preparation? Even if you had a good preparation, how easy would it be for you to see what you thought you should see, to miscount 24 pairs, even to draw 24 pairs? The alternative story adds in an element of technology too – photomicroscopy. In 1955 you could photograph what was under the microscope, make a hard copy, cut out the chromosome pairs and remove any doubt. Not so easy in 1912.

I don't know if this is true, I haven't seen either the 1912 nor the 1956 papers, so I don't know if either features a photograph. But it is easy to believe that until you could provide incontravertible evidence, such as a photograph, then it would be difficult to persuade a journal editor that you were right and the scientific community had been wrong for almost 50 years.

Tony Auffret
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