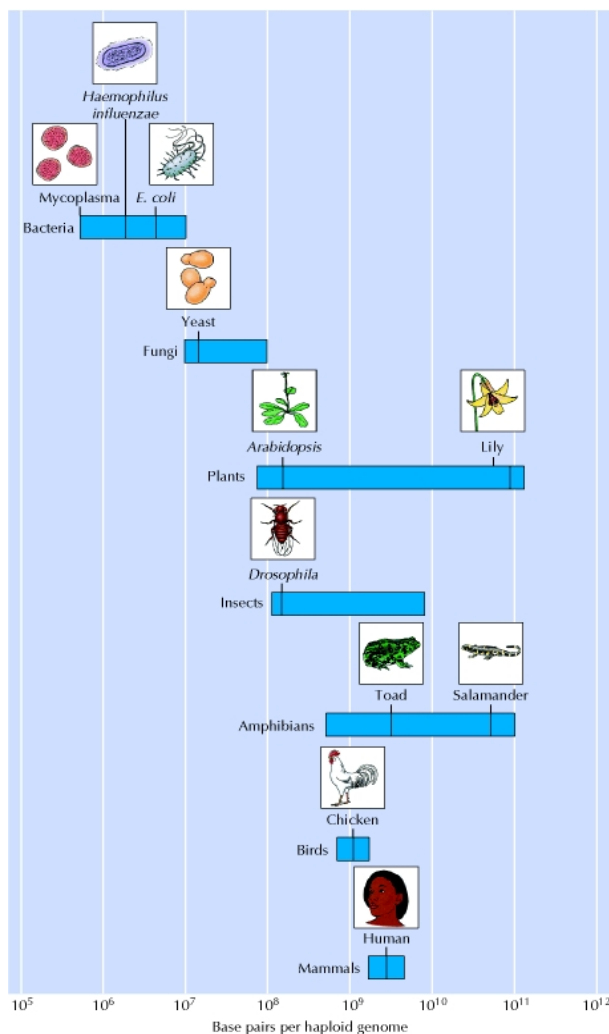


2- How can you explain human complexity when we have so few protein coding genes, e.g. about 5,000 less than a cucumber?

At the turn of the 21st century, many scientists thought the way to explain human complexity was closely related to the number of genes we have, which they believed to be around 100,000 (1). However, the International Genome Sequencing Consortium in 2001 revealed that our genome had between 30,000 and 35,000 genes, far less than expected (2). Moreover, in 2004, the number was lowered to an estimate of 20,000-25,000 genes (1). [So what is the real key of our complexity? [addition, O.P.]

To find the answer to this question, we should look to our environment and compare our genome to other species, [addition, OP]. Research shows the fly *Drosophila melanogaster* has 14,039 genes; the nematode *Caenorhabditis elegans* possesses approximately 20,069 genes although it is made of 1,000 cells; *Strongylocentrotus purpuratus*, a sea urchin, has 23,300 and the rice species *Oryza sativa* over 50,000 genes (1).



The range of sizes of the genomes of different species including humans (3)

All of them have an exaggerated number of genes in relation to their complexity, so the key is not the number but the function of these genes [addition, OP].

From our genome, just one third is coded into proteins (3), the remaining was thought to be useless which has since been proven false [addition, OP]. These non-coding protein sequences called introns are separated from protein-coding genes on mRNA (4) and form what is commonly called ncRNA (non-coding RNA).

Even though most of the functions carried out by ncRNAs are still unknown, we do know that microRNAs and snoRNAs, which are ncRNA subcategories, have a regulatory function. They control the synthesis of proteins and “appear to comprise a hidden layer of internal signals that control various levels of gene expression in physiology and development, including chromatin architecture, transcription, RNA splicing, editing, translation and turnover” (5).

After this explanation we reach the conclusion that the study of the chemical reactions which occur in our organism, activating and deactivating when needed parts of the genome, epigenetics, is what makes us as complex as we are (6). Human complexity is like a fight: the result is not determined by the fighter's brute strength, but by his ability to know when and how to use it [addition, OP].

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