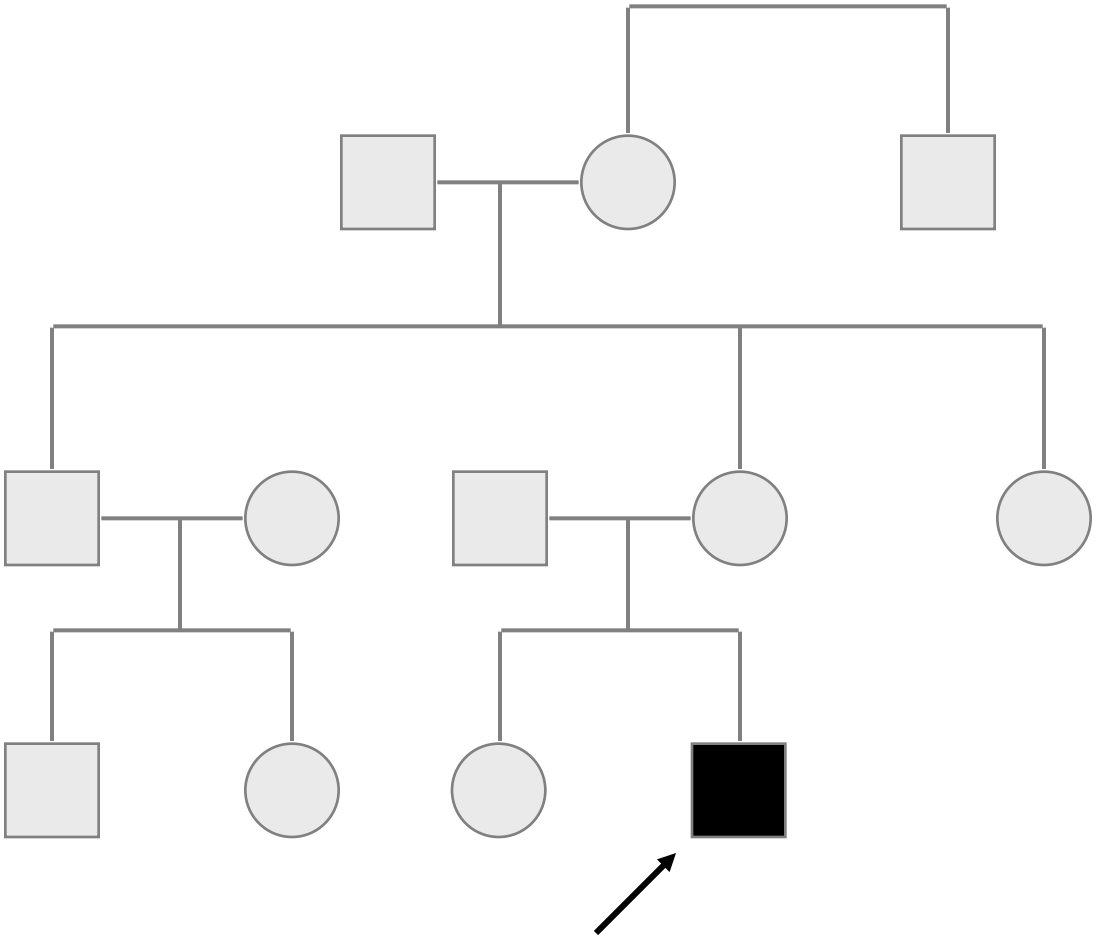
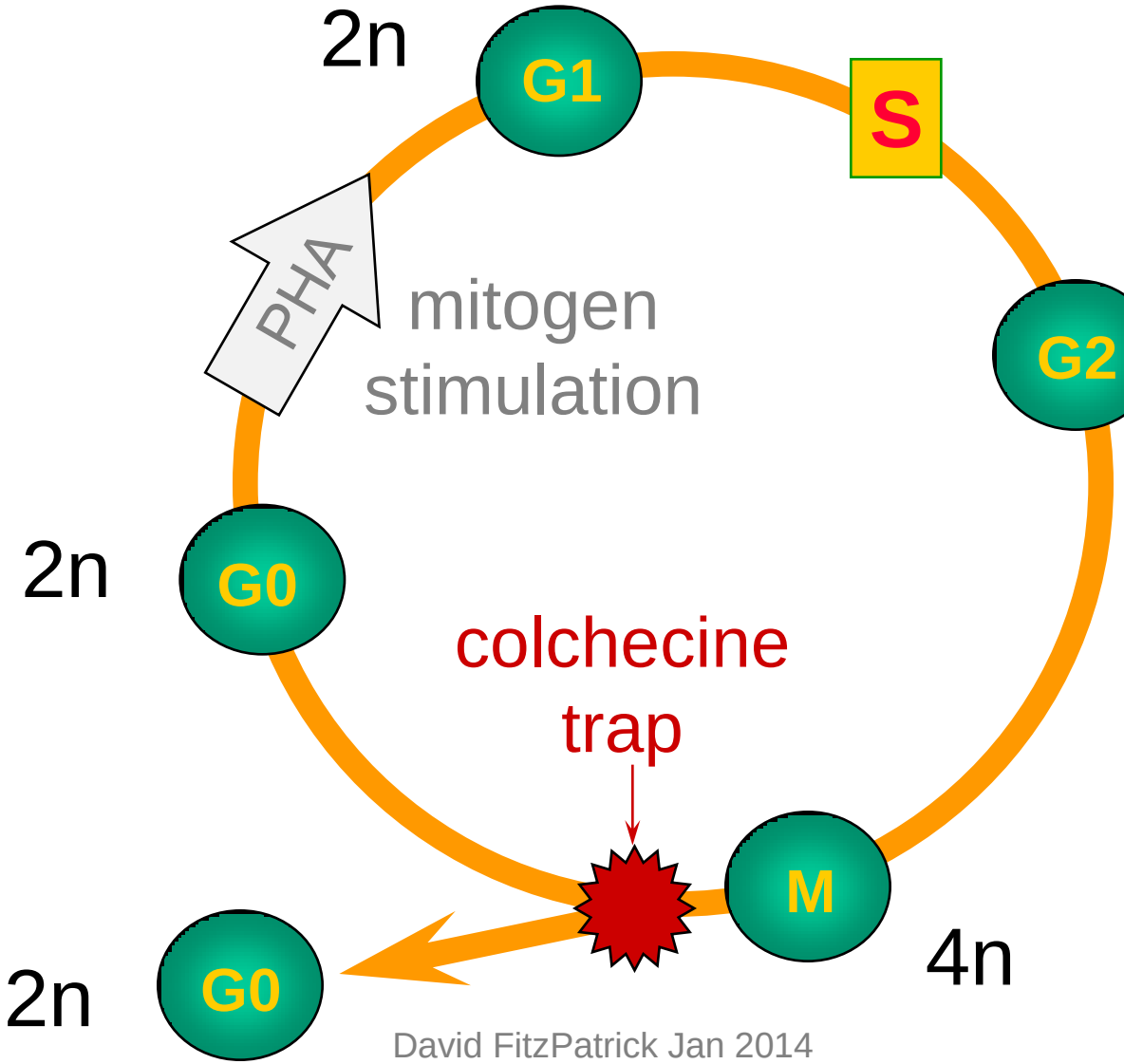
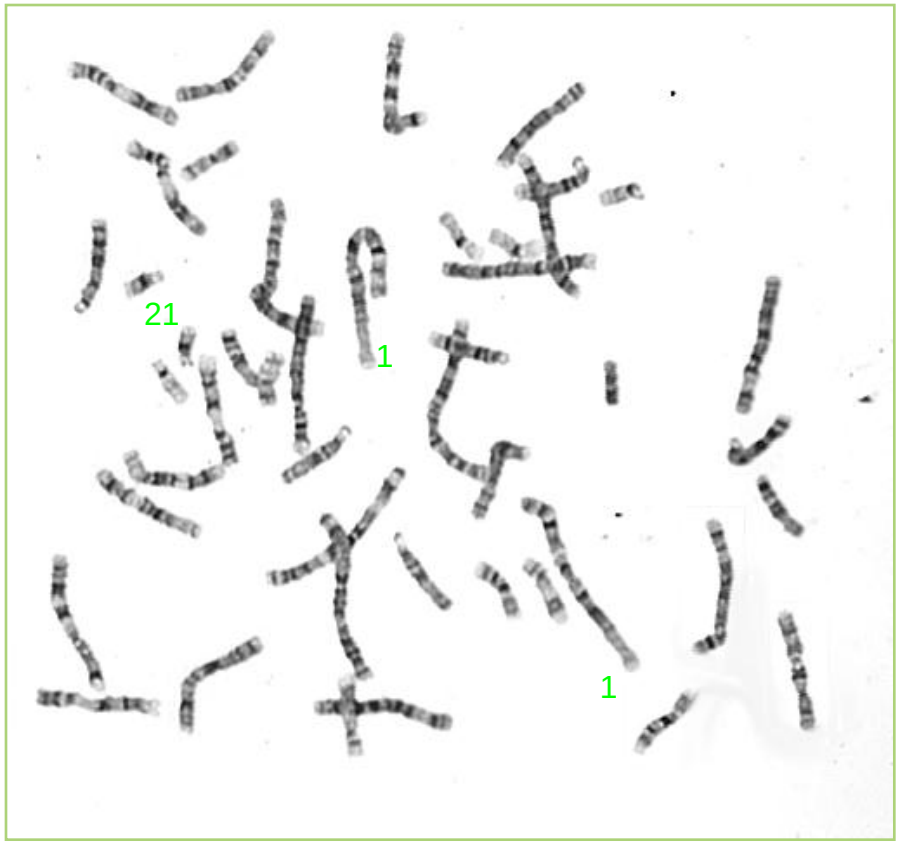
Case 1



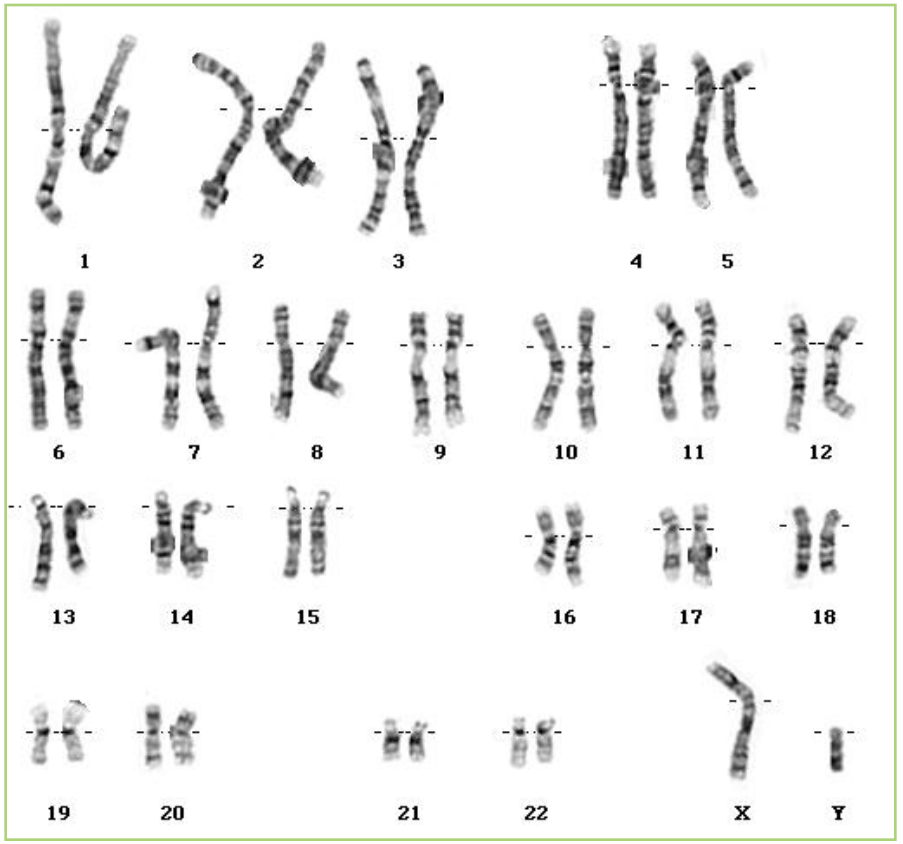
Conventional (light microscopy)

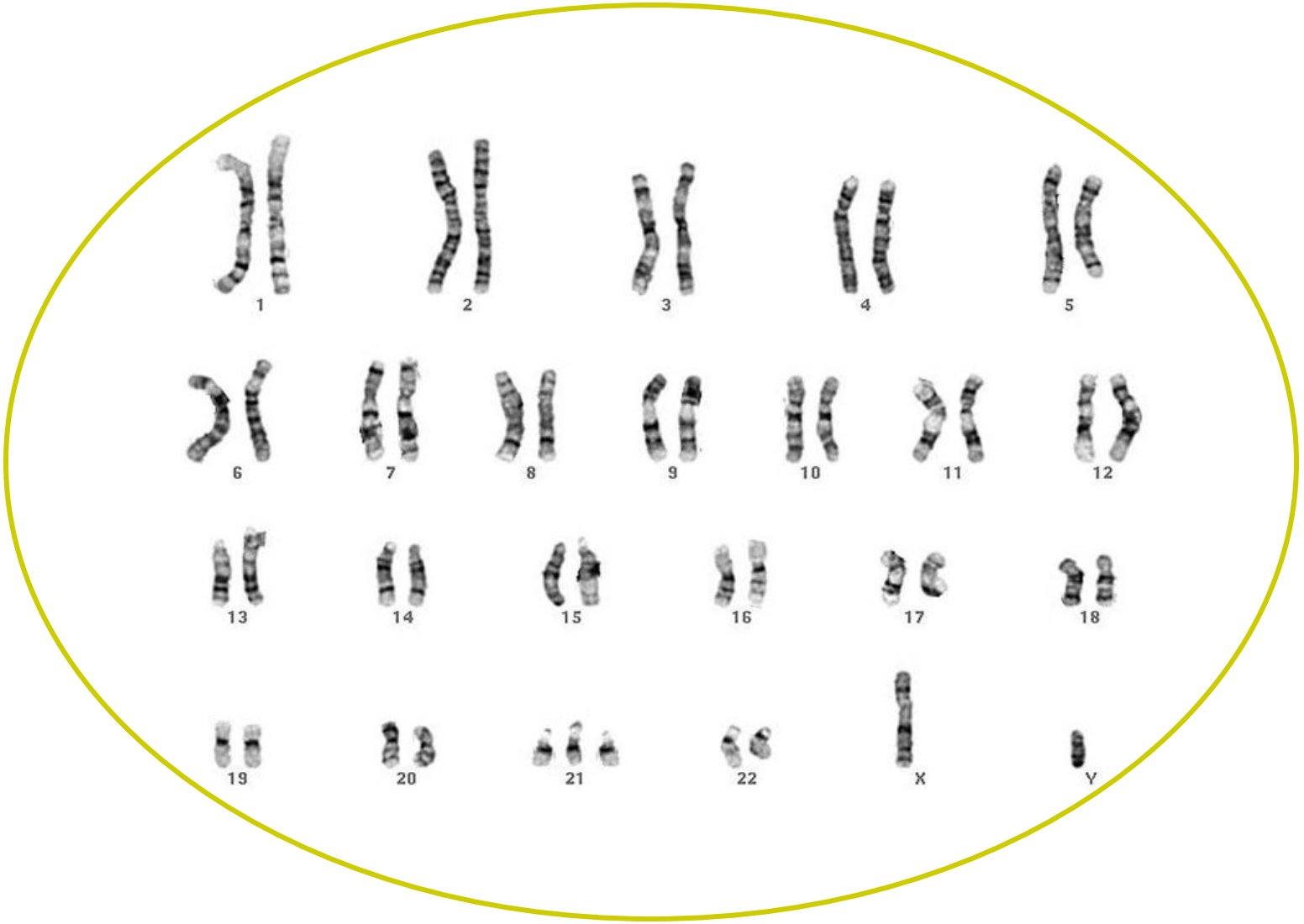


metaphase spread



karyotype





47

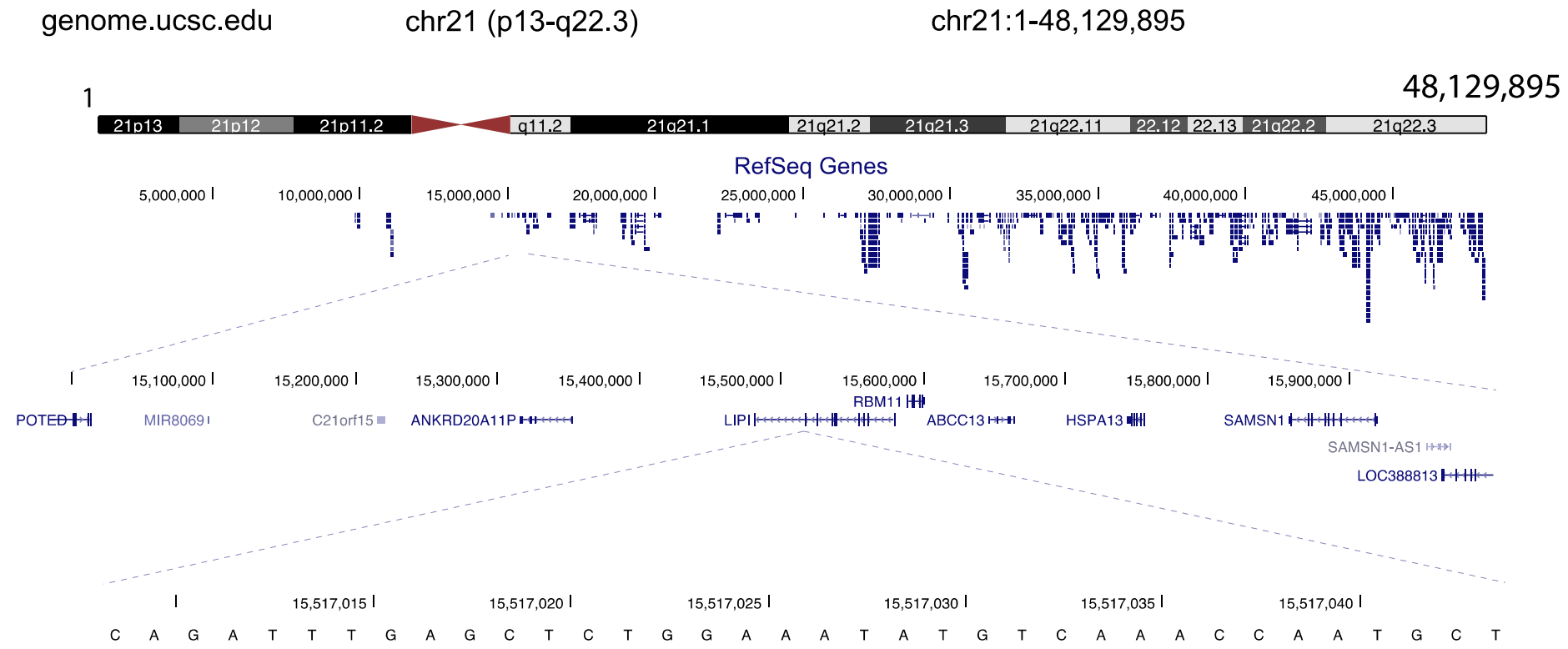
David FitzPatrick Jan 2014
Chromosome I

XY

David FitzPatrick Jan 2014
Chromosome I

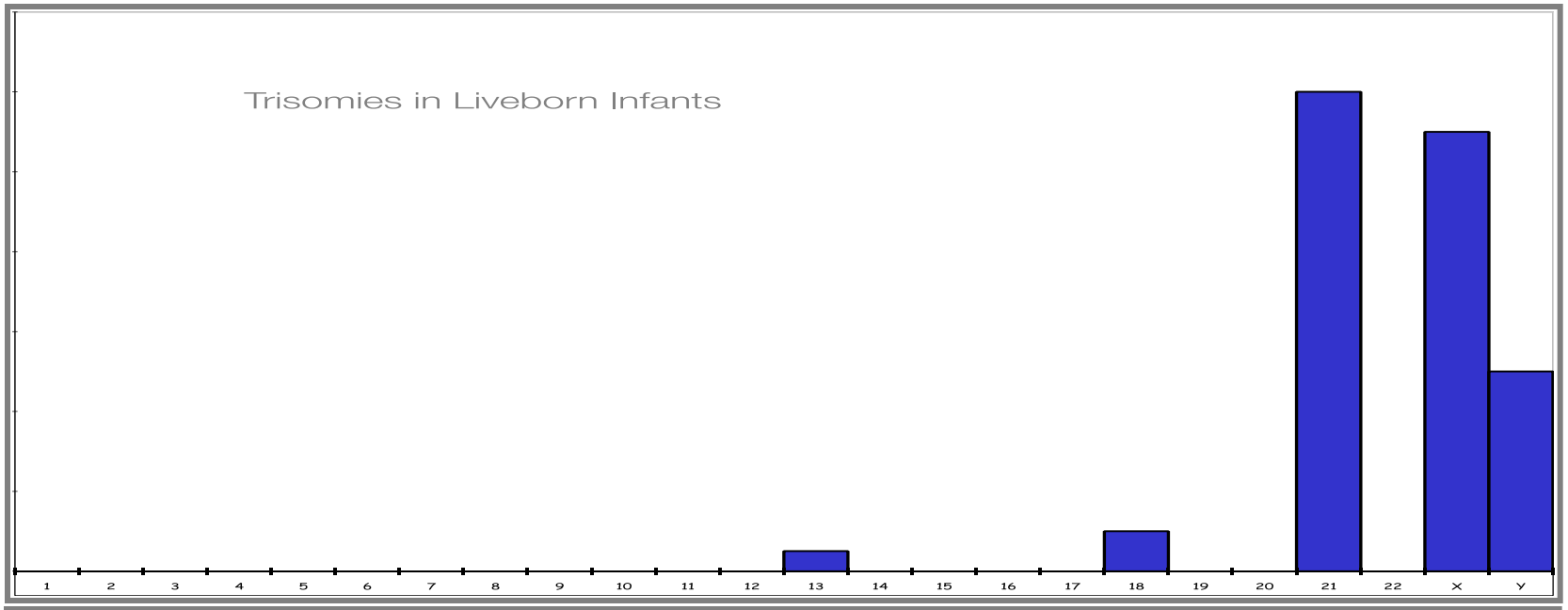
+21

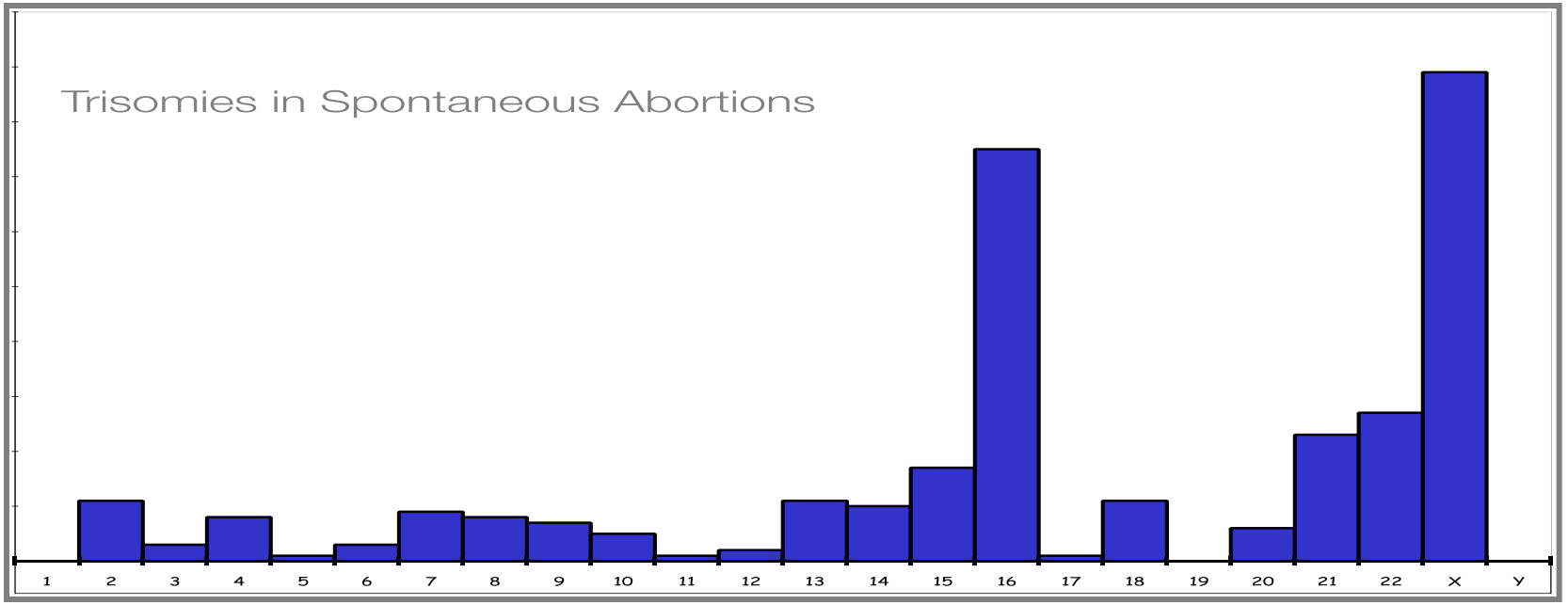
David FitzPatrick Jan 2014
Chromosome I


genome.ucsc.edu
chr21 (p13-q22.3)
chr21:1-48,129,895
1
48,129,895
21p13
21p12
21p11.2
q11.2
21q21.1
21q21.2
21q21.3
21q22.11
22.12
22.13
21q22.2
21q22.3
RefSeq Genes
5,000,000
10,000,000
15,000,000
20,000,000
25,000,000
30,000,000
35,000,000
40,000,000
45,000,000
15,100,000
15,200,000
15,300,000
15,400,000
15,500,000
15,600,000
15,700,000
15,800,000
15,900,000
POTED
MIR8069
C21orf15
ANKRD20A11P
RBM11
LIPI
ABCC13
HSPA13
SAMSN1
SAMSN1-AS1
LOC388813
15,517,015
15,517,020
15,517,025
15,517,030
15,517,035
15,517,040
C A G A T T T G A G C T C T G G A A A T A T G T C A A A C C A A T G C T

numerical chromosome abnormalities

David FitzPatrick Jan 2014
Chromosome I

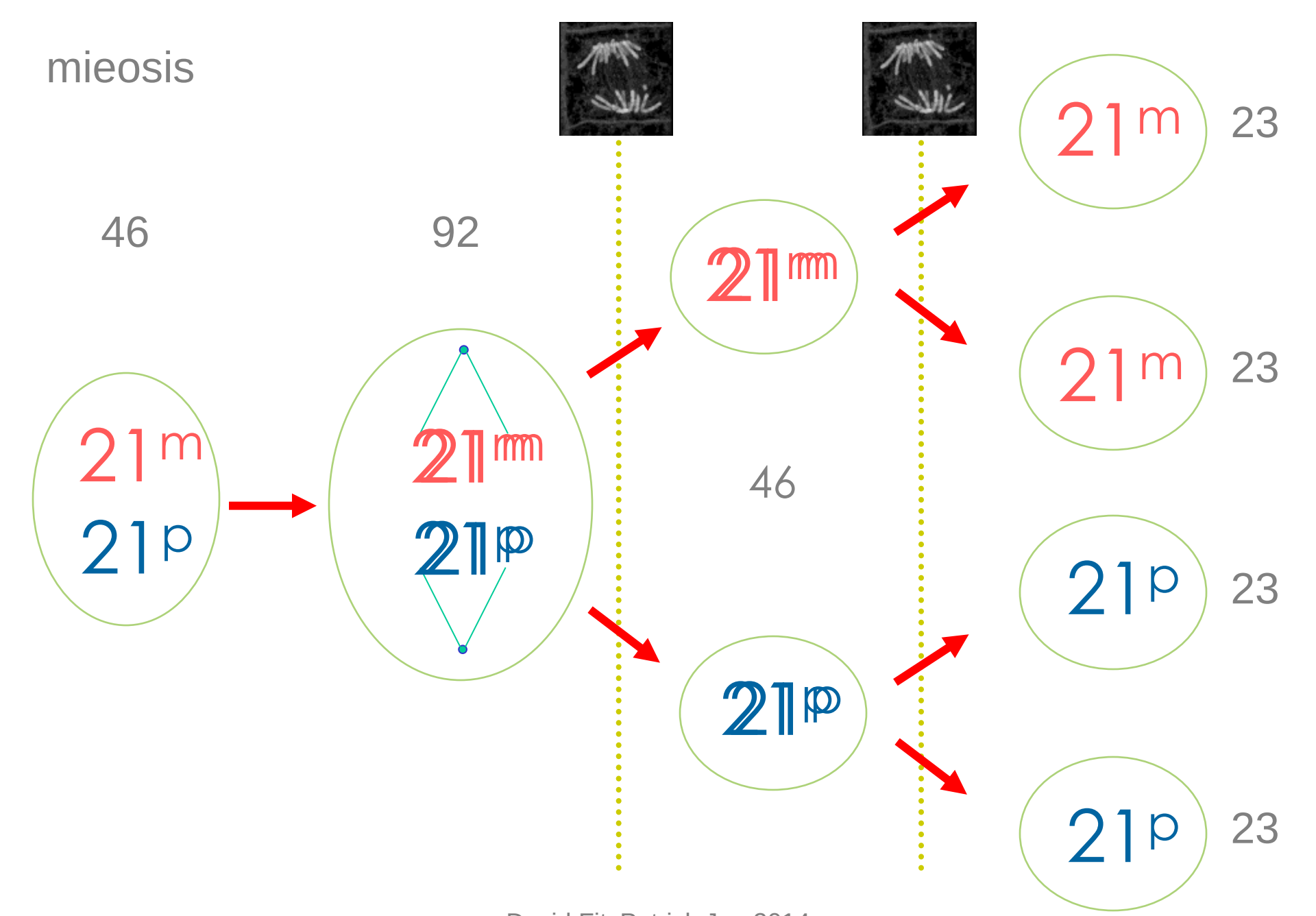




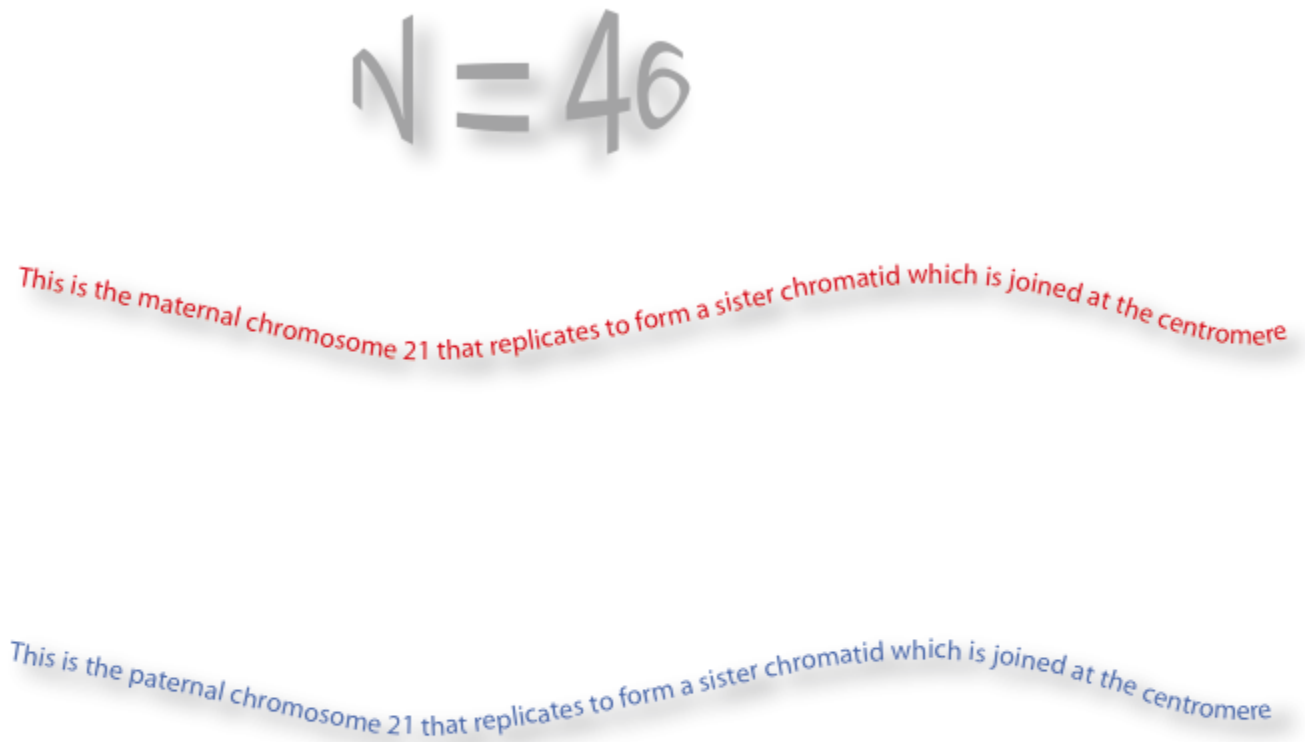
David FitzPatrick Jan 2014
Chromosome I

meiosis part 1

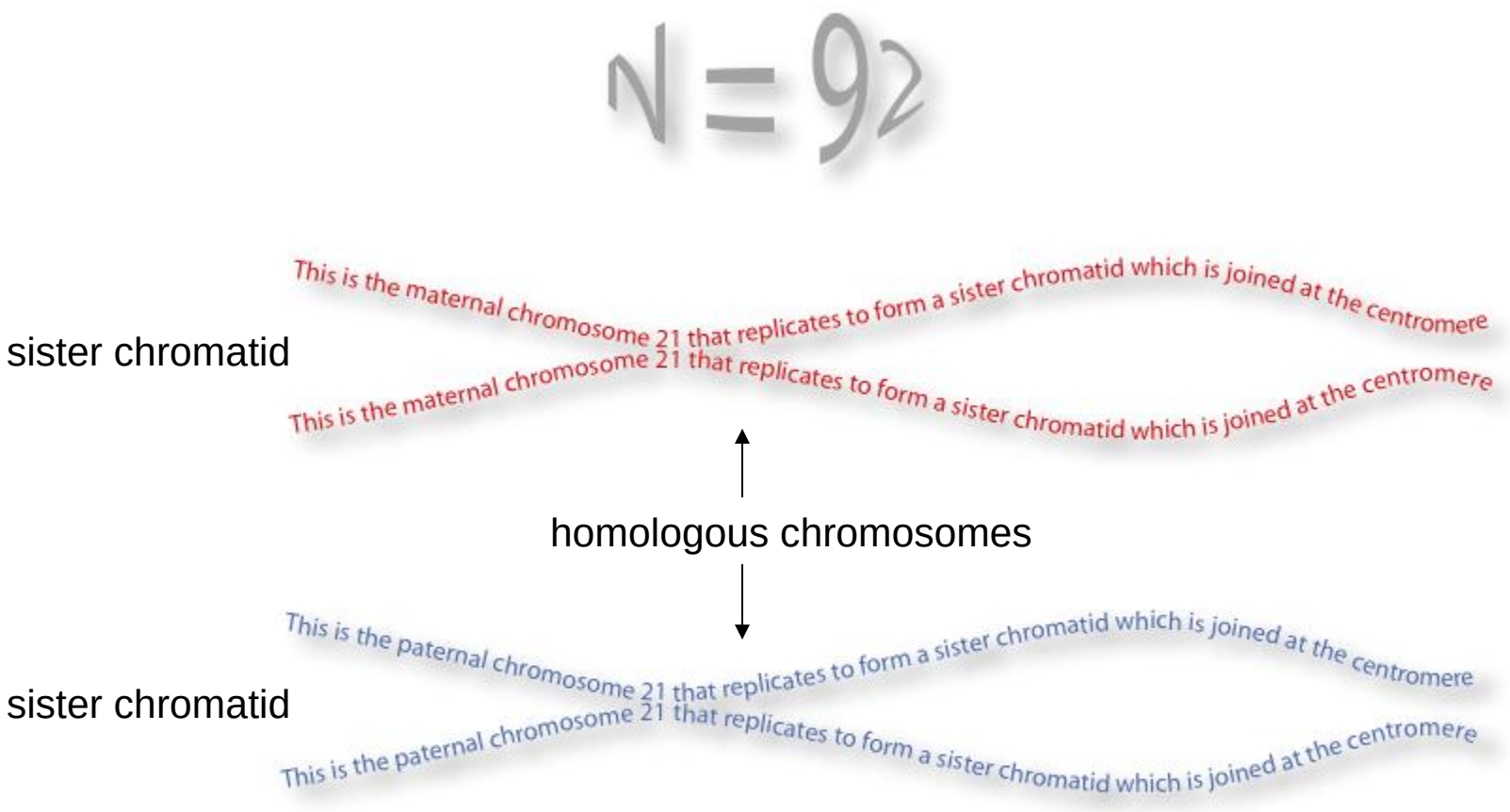
David FitzPatrick Jan 2014
Chromosome I

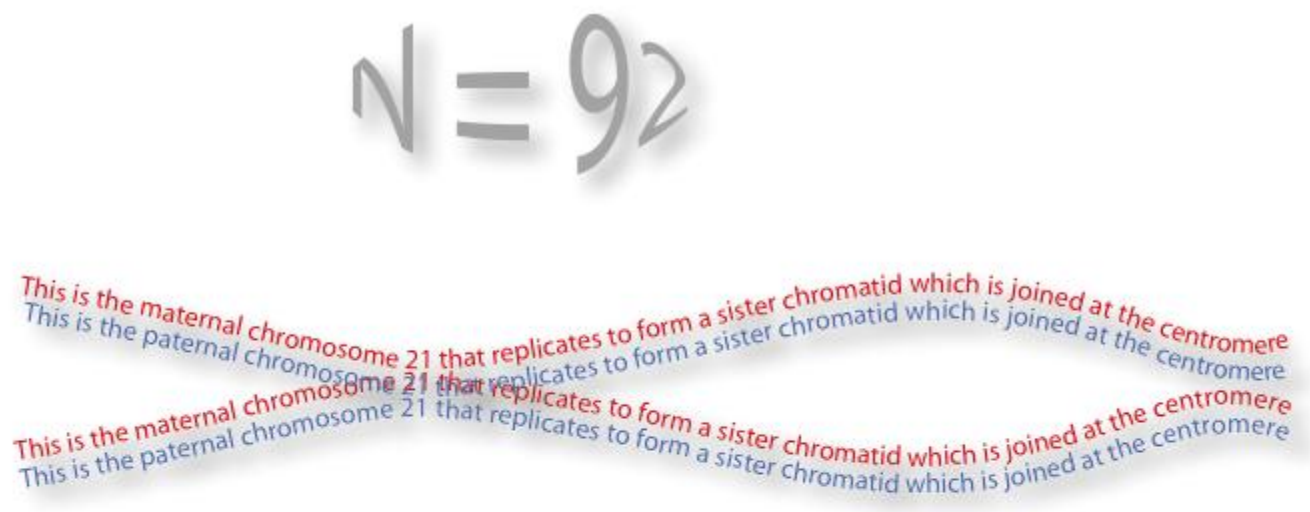


David FitzPatrick Jan 2014
Chromosome I

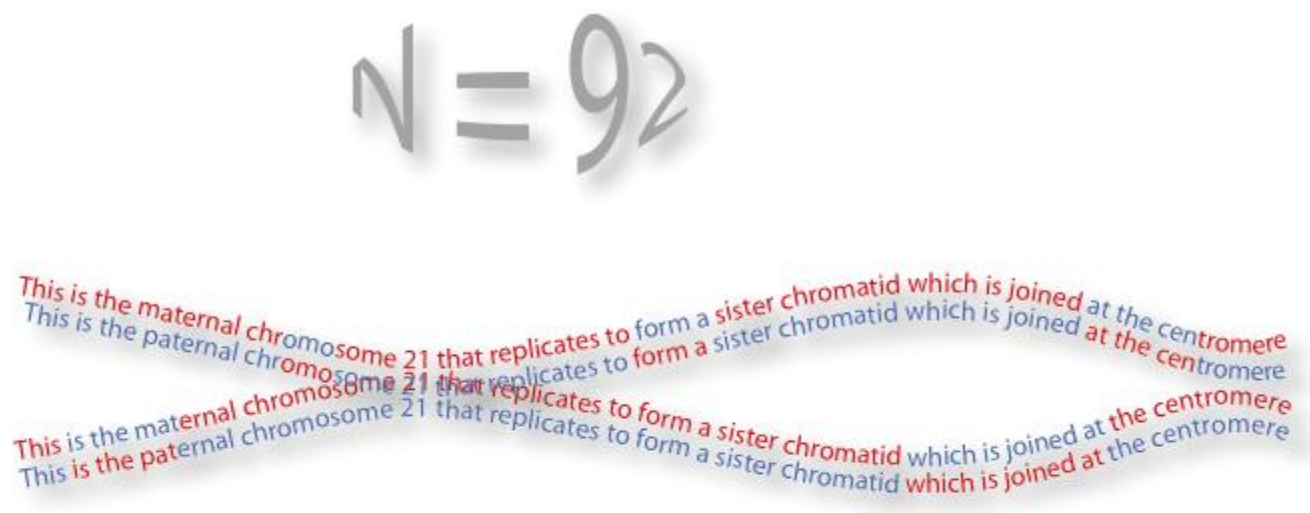


David FitzPatrick Jan 2014
Chromosome I


N = 92
sister chromatid
This is the maternal chromosome 21 that replicates to form a sister chromatid which is joined at the centromere
This is the maternal chromosome 21 that replicates to form a sister chromatid which is joined at the centromere
homologous chromosomes
sister chromatid
This is the paternal chromosome 21 that replicates to form a sister chromatid which is joined at the centromere
This is the paternal chromosome 21 that replicates to form a sister chromatid which is joined at the centromere

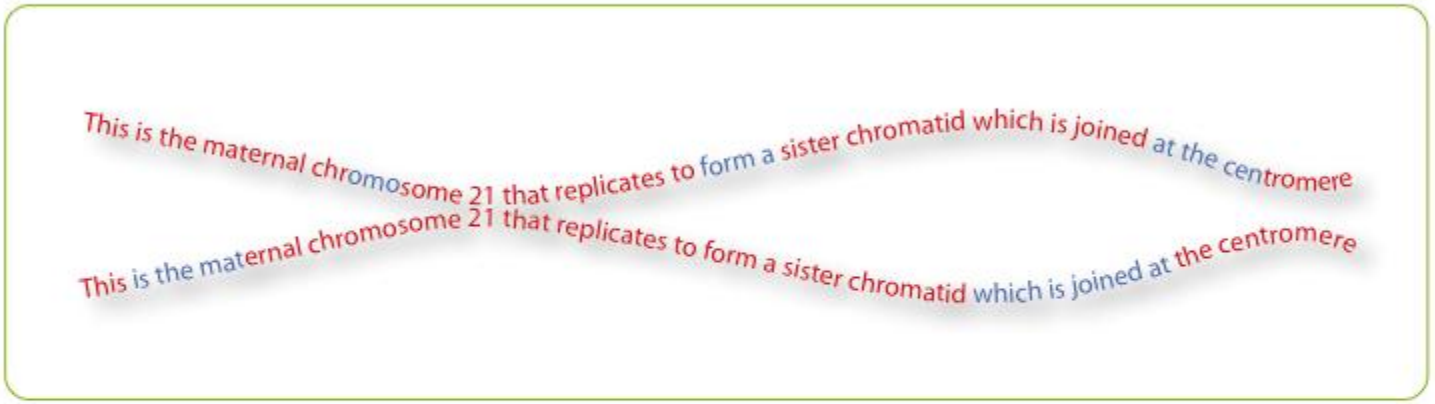


homologous pairing



homologous recombination

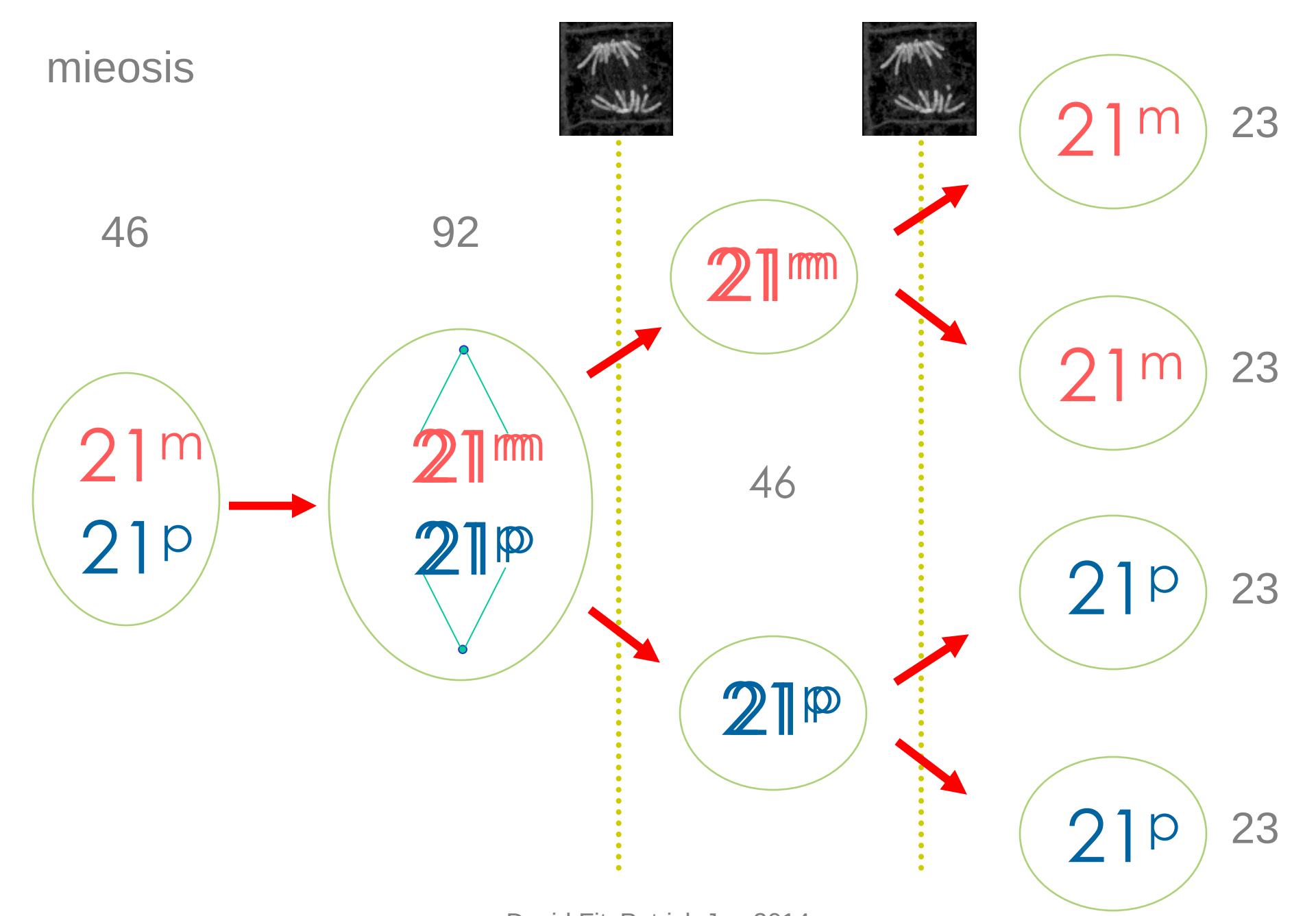
N = 46



first meiotic division

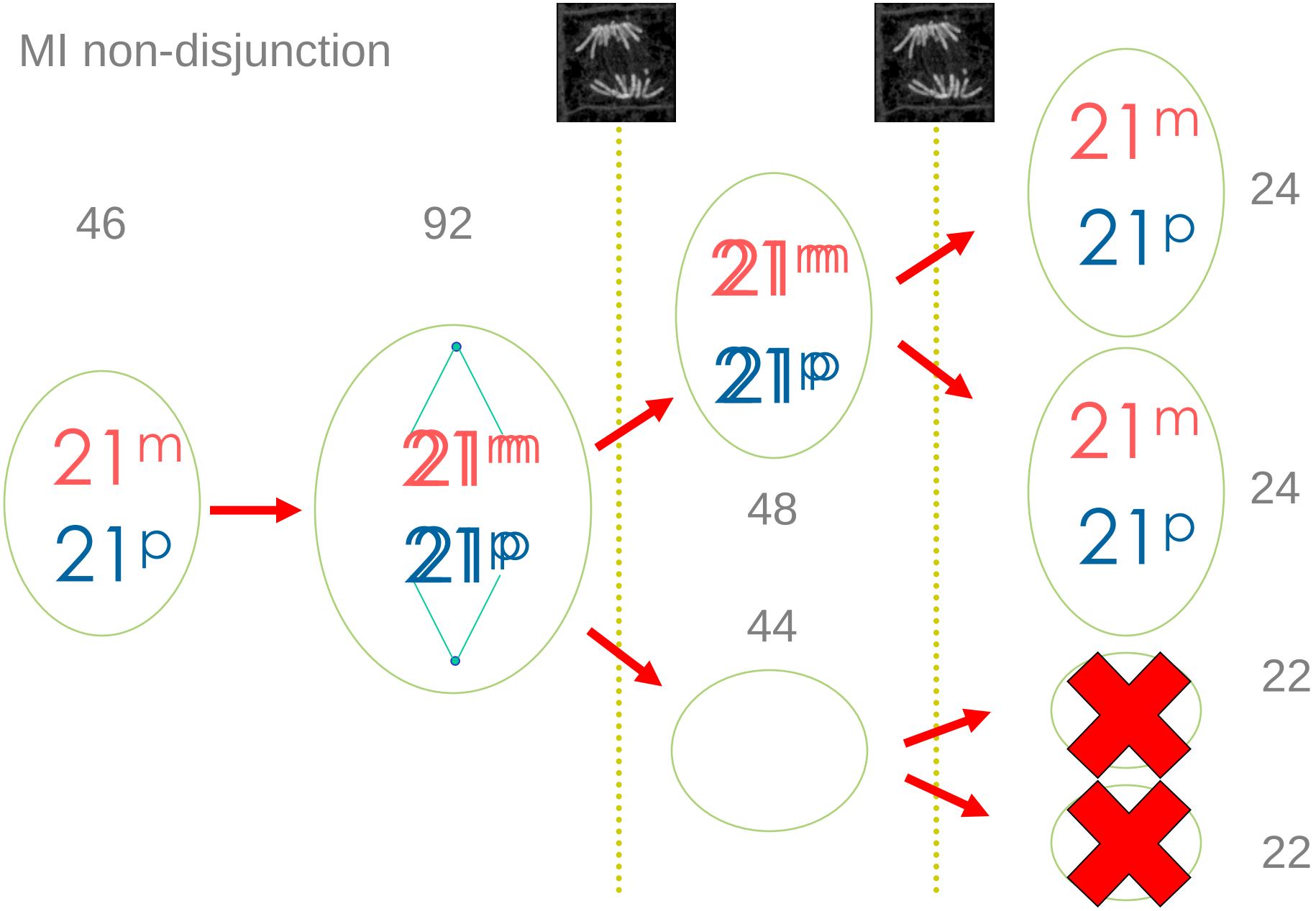
N = 23

second meiotic division

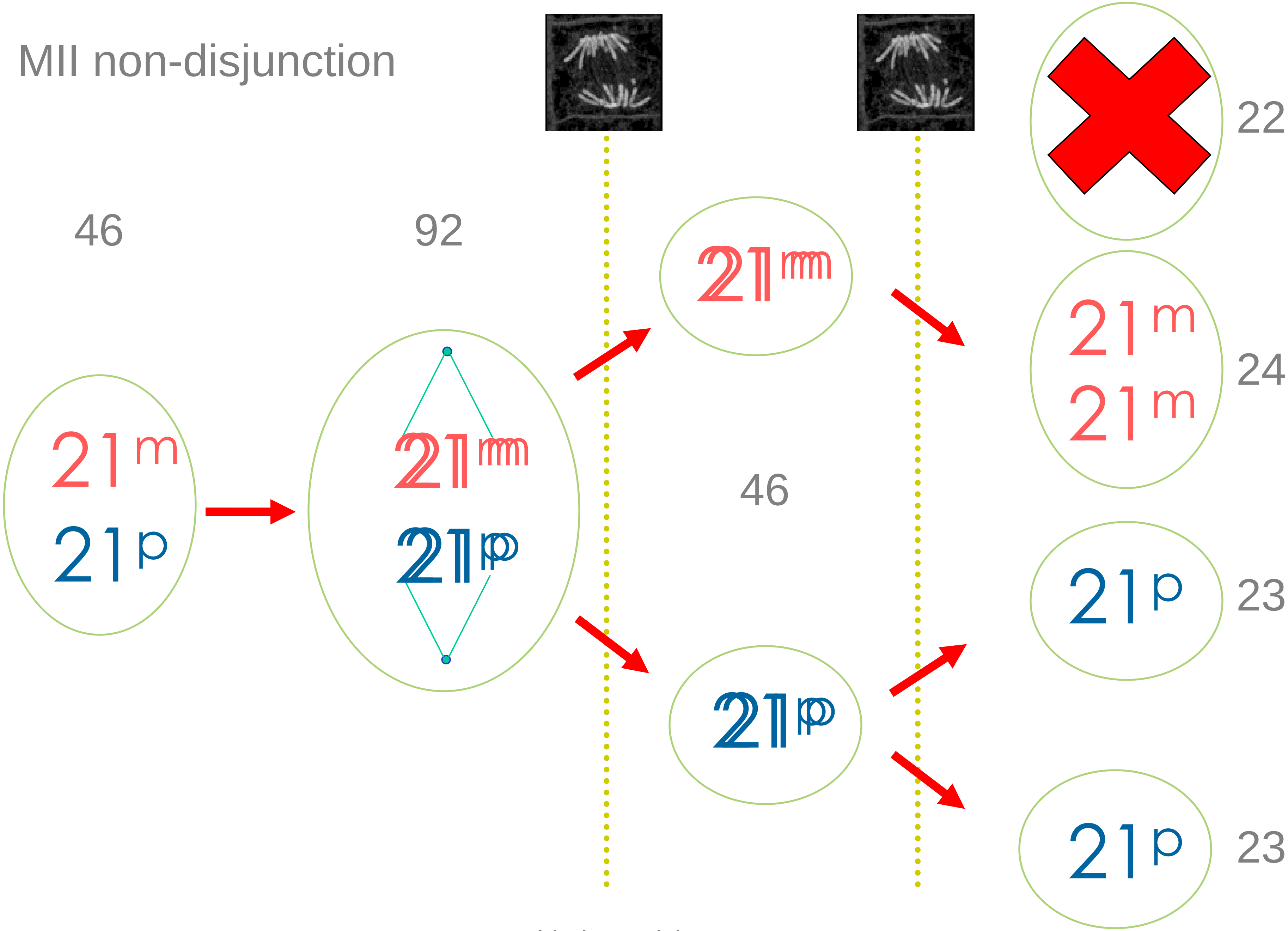


David FitzPatrick Jan 2014
Chromosome I

MI non-disjunction

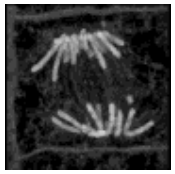


MII non-disjunction



David FitzPatrick Jan 2014
Chromosome I

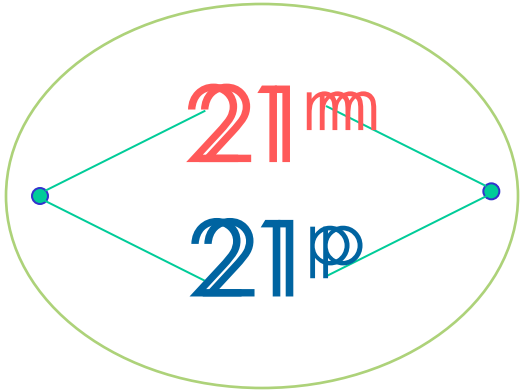
mitosis



46

92

21 m
21 p

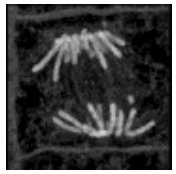


21 m
21 p

46

21 m
21 p

mitotic non-disjunction



47

45

46

92

21m
21p
21p

21m
21p

21m
21m
21p

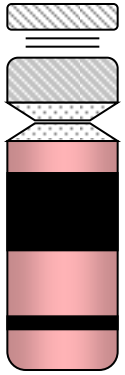
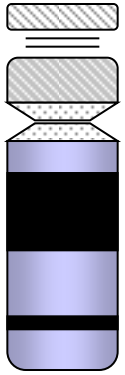
mosaicism

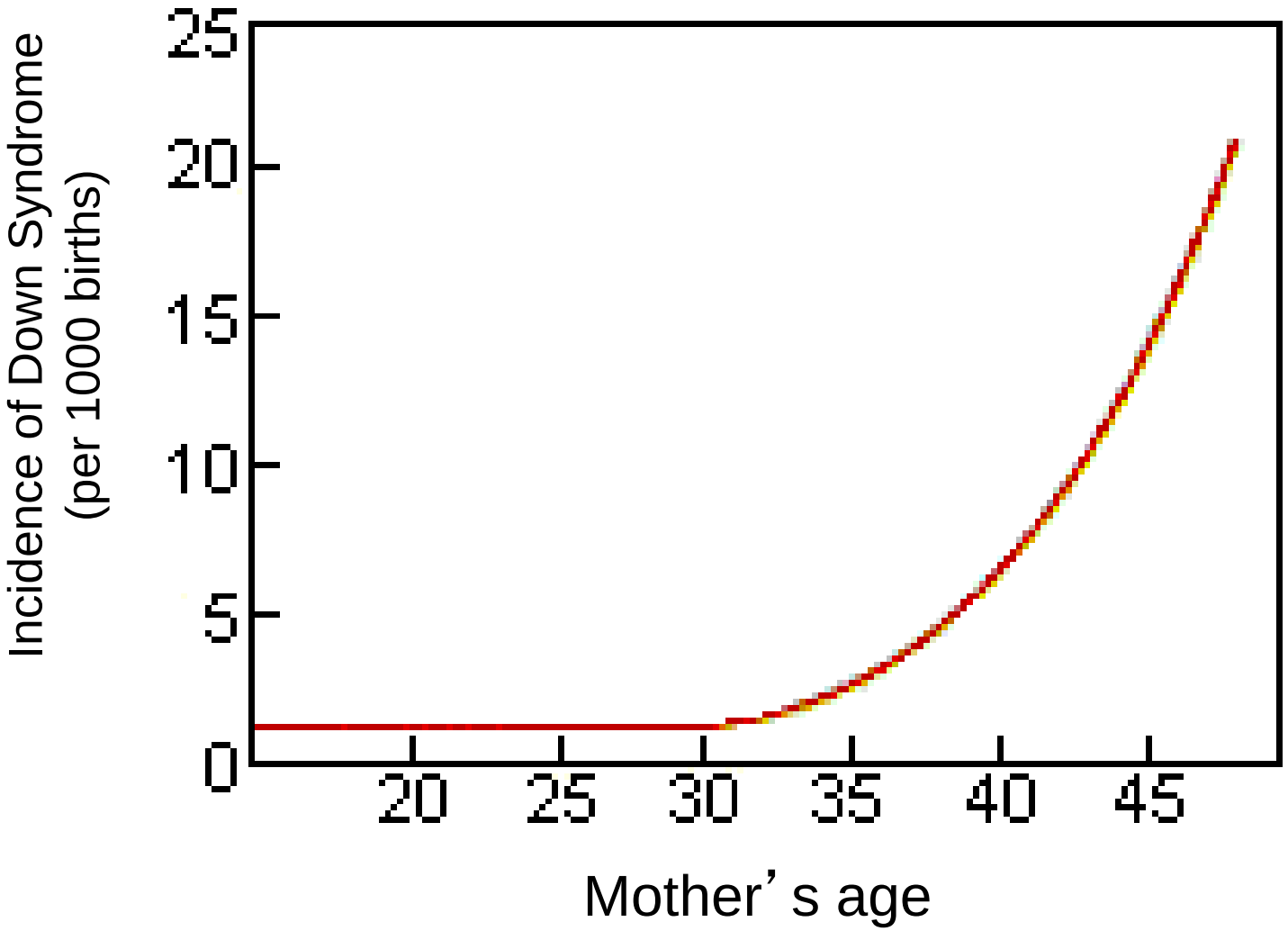
21m
21p

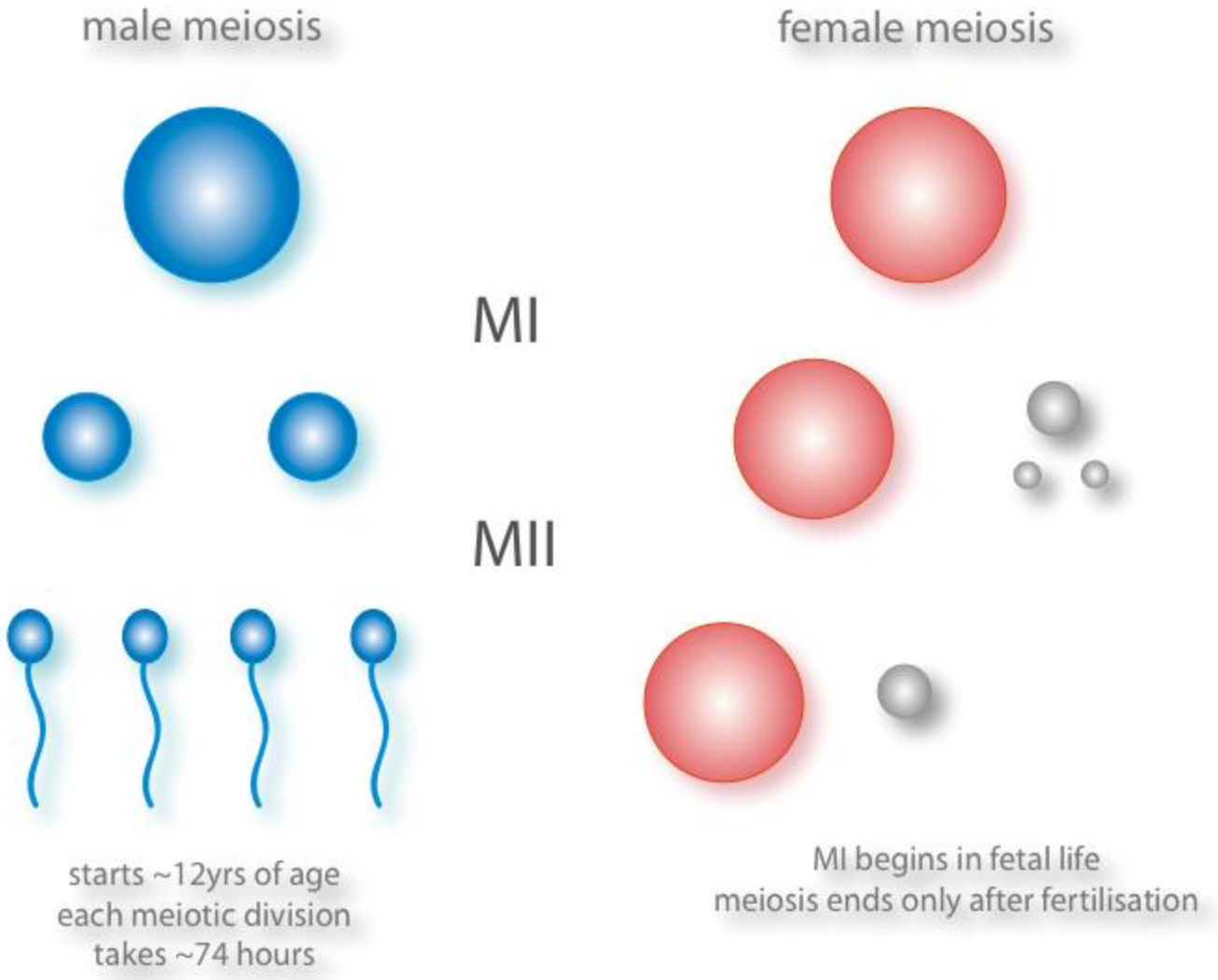
45

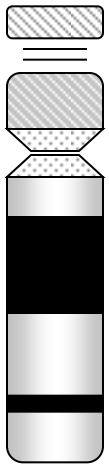
47

David FitzPatrick Jan 2014
Chromosome I

	MAT 21	PAT 21
		
	91.5%	8.5%
MI non-disjunction	69%	23%
MII non-disjunction	22%	36%
mitotic non-disjunction	2%	19%


Incidence of Down Syndrome
(per 1000 births)
0
5
10
15
20
25
20
25
30
35
40
45
Mother's age


male meiosis
female meiosis
MI
MII
starts ~12yrs of age
each meiotic division
takes ~74 hours
MI begins in fetal life
meiosis ends only after fertilisation



Length (bps):	48,129,895
Known Protein-coding Genes:	226
Novel Protein-coding Genes:	7
Pseudogene Genes:	149
miRNA Genes:	16
rRNA Genes:	5
snRNA Genes:	21
snoRNA Genes:	19
Misc RNA Genes:	8
SNPs:	680,167