**Guidelines for Evaluating Chromosome Spreads,**

**and Identifying the Human Chromosomes**

*\*\* To be used as part of the Identification of Human Chromosomes Homework Assignment*

1. If you were doing this as a cytogenetist, you would first count the chromosomes. Some chromosomes overlap, so you may need help in distinguishing each chromosome.
   1. If the number is 46, there is no abnormality.
   2. A total of 47 indicates trisomy.
   3. A total of 45 indicates monosomy.

In your case this is a metaphase spread with no chromosomal abnormalities, so the chromosome number is 46. However, you should count them anyway to help you start differentiating the chromosomes.

1. Identify the ten largest chromosomes. These are Groups A and B, chromosomes 1 through 5.
   1. Arrange these according to (1) size, (2) centromere position, and finally (3) banding pattern.
   2. Note that chromosomes 1, 2, and 3 are metacentric or nearly so, whereas chromosomes 4 and 5 are distinctly submetacentric.
   3. Chromosomes 1 and 2 are significantly longer than 3 through 5, which are about the same length.
   4. Chromosome 1 is very light in the upper half of the short arm.
   5. Chromosome 2, in contrast, has four distinct bands on the short arm and has a light region at the very end of the long arm.
   6. Chromosome 3 has a very dark band just below the centromere and a dark band near the end of the short arm followed by a clear area.
   7. Chromosome 4 has a distinct clear region at the end of the short arm.
   8. Chromosome 5 has a very dark band in the middle of the short arm and a light region at the end of the long arm.
2. Identify the eight (or nine) smallest chromosomes. These are Groups F and G, chromosomes 19 through 22 (and Y).
   1. If the chromosomes are from a male, there will be a Y chromosome, which is fairly evenly stained with bands that are rather indistinct.
   2. Chromosomes 21 and 22 should be the smallest, and since they are acrocentric they are vaguely pear-shaped. Look carefully for the centromeres. Chromosome 21 has a very dark band just *under* the centromere; chromosome 22 has a dark band right *at* the centromere.
   3. Chromosome 19 has a very dark band right at the centromere; chromosome 20 has more bands, one on the short arm, one at the centromere, and two on the long arm.
3. Identify the six chromosomes slightly larger than 19 through 22. This is Group E, chromosomes 16 through 18.
   1. Chromosome 16 is noticeably larger than 17 and 18, which are very close in size.
   2. Chromosome 16 has a very dark centromere and two distinct bands on the long arm; the short arm is very lightly stained.
   3. Chromosome 17 also has two distinct bands on the long arm, but they are closer together than those on chromosome 16. It is also lighter at the centromere region.
   4. Chromosome 18 has four distinct bands on the long arm; beginning at the centromere they are: two dark bands close together, then a less distinct band, and then a darker, broader bands near the end of the arm.
4. Identify the six medium-sized acrocentric chromosomes. This is Group D, chromosomes 13 through 15. They are only slightly longer than the Group E chromosomes, but can be distinguished by having centromeres very near one end.
   1. First try to pair the chromosomes up by aligning all six and matching the banding patterns. \*\*Do not go by their length\*\*
   2. Chromosome 13 has two very distinct bands on the long arm (the upper of which is actually two closely spaced bands). The bands above these are relatively light.
   3. Chromosome 14 has one very distinct band toward the end of the long arm with a broad clear region between it and the end of the arm. It also has two distinct bands not far below the centromere.
   4. Chromosome 15 has two bands near the end of the long arm (one is right at the end). Above those is a clear area and then two rather distinct bands.
5. Finally, assort the remaining medium-sized submetacentric chromosomes. There will be either fifteen (in males) or sixteen (in females). This is Group C, chromosomes 6 through 12 and X. Arrange them first by size and then by banding pattern. Make sure to locate the centromeres and orient the chromosomes with the short arms up.
   1. Chromosome 6, clearly the longest of the group, has a broad clear area in the middle of the short arm, dark bands just above and below the centromere, and fairly evenly spaced bands along the long arm.
   2. Chromosome 7 has a very dark band very near the end of the short arm and a very dark band not far below the centromere on the long arm.
   3. Chromosome 8 has a very dark band near the end of the long arm and two equally stained bands on the short arm.
   4. Chromosome 9 has three distinct bands on the short arm (the middle of which is broadest). The region below the centromere is very light, followed by three bands (the first of which is broadest).
   5. Chromosome 10 has three evenly spaced bands on the long arm; the first one is just below the centromere and is darker than the other two.
   6. Chromosome 11 has a broad clear area below the centromere followed by two closely spaced dark bands. The short arm has two bands near the centromere; the end of the arm is clear.
   7. Chromosome 12 has one predominant band on the short arm and a strong band just under the centromere followed by a clear area (not as broad as that on chromosome 11). Under that are three bands (the middle of which is darkest); the end of the long arm is clear.
   8. The X chromosome is intermediate in size between chromosomes 7 and 8. It has a very distinct band in the middle of the short arm and three distinct bands on the long arm, the first of which (right in the middle of the arm) is broader than the other two.