**Proposition I.30**

*Speaker: Menglu  Scribe: Mark, Artist: Ruifan*

**Proposition I.30**

*Straight lines parallel to the same straight line are also parallel to one another.*

Proof:

Let $AB$ and $CD$ be straight lines parallel to the same straight line $EF$.

We want to prove that $AB$ and $CD$ are parallel to each other.

Let $GI$ be a line falling on $AB$ and $CD$, meeting $AB$ at $G$ and $CD$ at $I$.

Suppose $GI$ also meets $EF$ at $H$.

We have angles $\angle 1 = \angle AGH$, $\angle 2 = \angle GHF$, $\angle 3 = \angle HID$.

Since $AB \parallel EF$ the alternate interior angles $\angle 1$ and $\angle 2$ are equal. [I.29]

Since $CD \parallel EF$ the exterior $\angle 2$ equals the interior and opposite $\angle 3$ [I.29]

Therefore the interior and opposite angles $\angle 1$ and $\angle 3$ are equal. [c.n. 1]

So $AB \parallel CD$ [I.27]

Q.E.D.

Remark: It is not obvious that $GI$ meets $EF$. One can prove this using I.29 which relies on Post. 5. In fact I.30 is equivalent to Post. 5.