

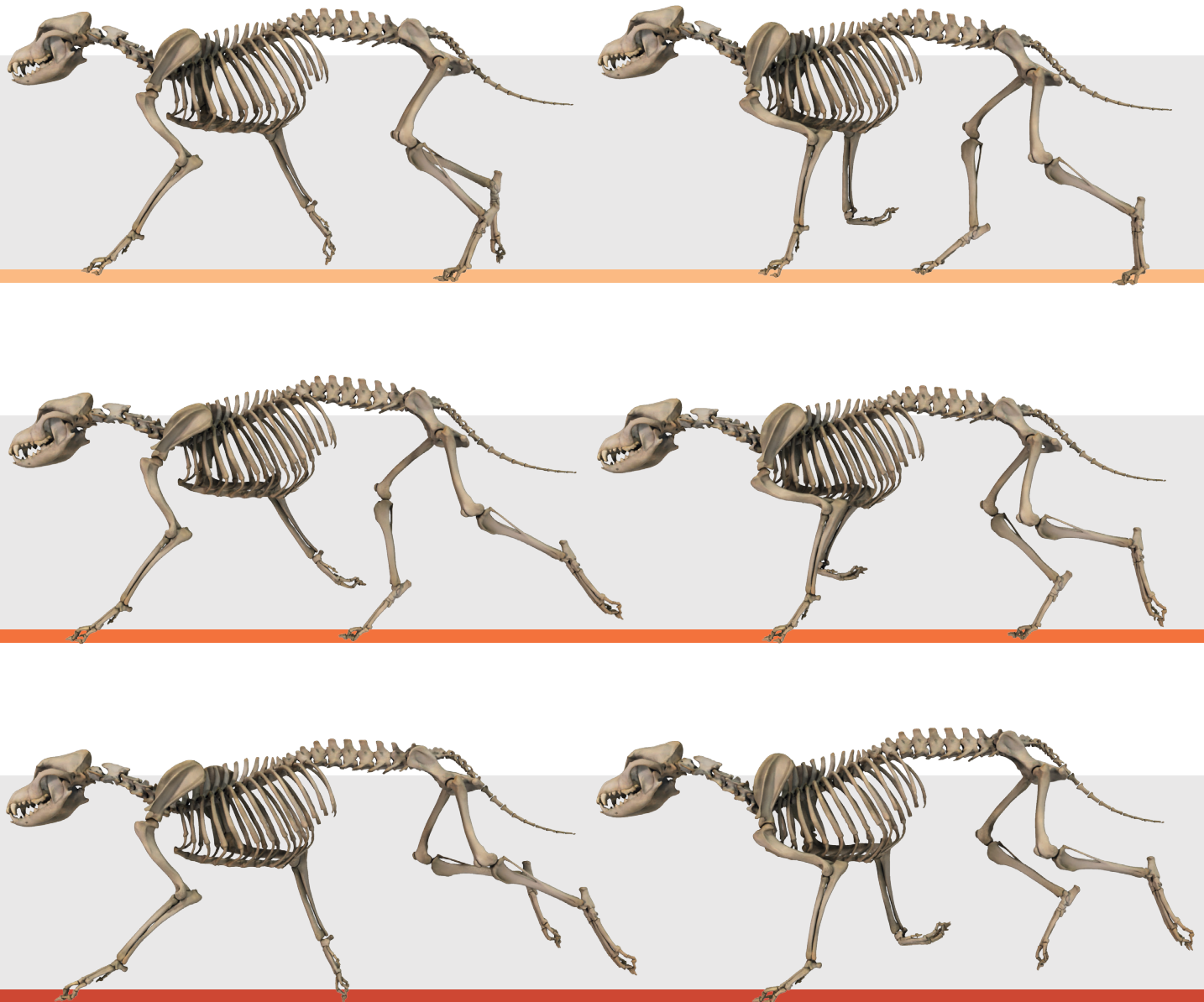
MOTION SEQUENCE

Locomotion is a continual, cyclical sequence of repeated movements. The movement performed by the forelimb is essentially the same in all gaits, while the movement of the hindlimb differs between the symmetrical gaits walk and trot on the one hand and the gallop on the other. A motion cycle consists in dogs of the retraction (backwards movement) of the limbs during the stance phase and

their protraction (forwards movement) in the forward swing phase. In terms of locomotion, limbs consist of three potentially propulsive elements. In the forelimbs these are, in decreasing order of importance the ground distance traveled by the limb, the shoulder blade, upper arm and forearm. The forefoot can be neglected. In the hindlimb these elements are the femur, lower leg and hindfoot.

PIVOT POINT OF THE LIMBS

For the fore- and hindlimbs to be able to work uniformly, their pivot points need to be located on a level with each other. The pivot point of the hindlimb is located in a form-fitting joint, the hip joint. As the forelimb is only connected to the trunk via muscles, it does not move round a fixed point but round what is known as an instantaneous center of rotation, which in



the X-ray film can be identified with a fair amount of precision on the upper edge of the shoulder blade. The instantaneous center of rotation is the equivalent of a force transmission joint, in which the position of the center of rotation is a function of the level of activity of the various extrinsic shoulder muscles and the force impulse on the limb. In kinematics, an instantaneous center of rotation is said to exist

when the motion of a body consists of a combination of translation and rotation. A translation of the shoulder blade along the thoracic cage can be observed at the end of the stance phase in particular. The scapular pivot point moves up and down during a step cycle. The pivot points of the limbs on the same side of the body change height at the same time. When the hip is low, the front pivot point is also low.

STANCE PHASE

The motion that takes place during the stance phase consists of the largely uniform retraction of the limbs and their three elements at almost constant angular velocities (Owen et al. 2004). The first and third elements move in parallel. Fischer & Witte (1998) described this principle of movement as a “pantograph leg”. As in this once-popular drawing aid, which was

