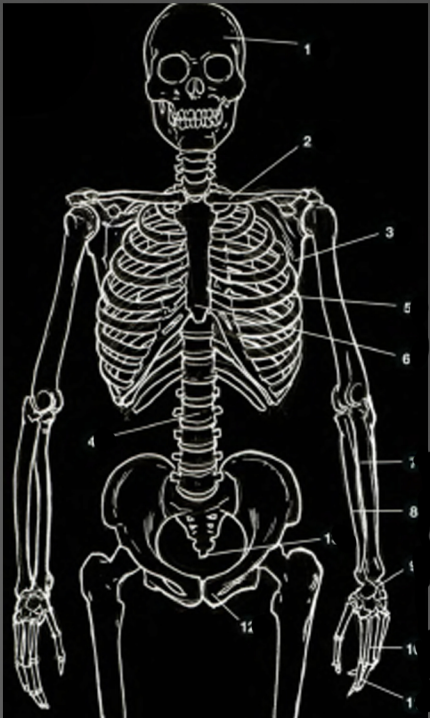
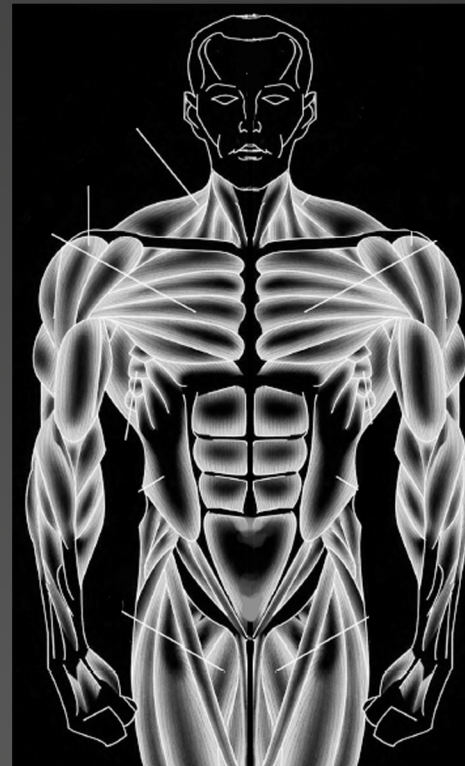


ANATOMY STUDY OF ADDING WINGS TO A HUMANOID BODY USING ZBRUSH AS AN ILLUSTRATION TOOL

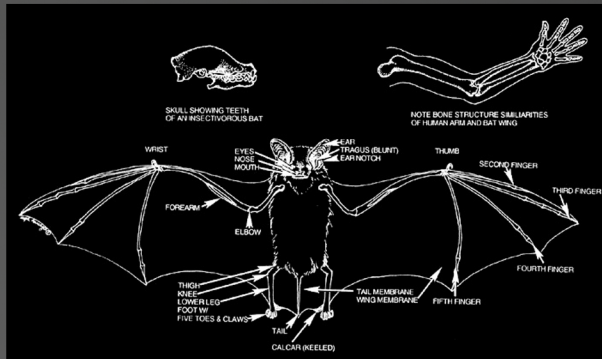
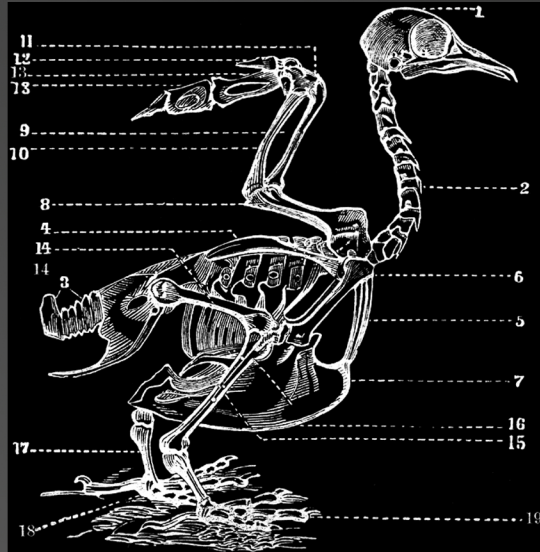


The Human body per se is has a complex bone and muscle structure in, unfortunately it is not made to fly, for some anatomically reasons, such as weight, muscular mass and bone structure, we do not have wings, nor our body would allow us to have four limbs, the second pair meant to hold the wings, as we are used to see in fantasy pieces.

In any case if we created a believable mutation, as an artist licence, the wingspan would probably be incorporated in the torax muscular mass, and we would have some extra musculature and bone structure, that as humans we lack and would need in order to fly.



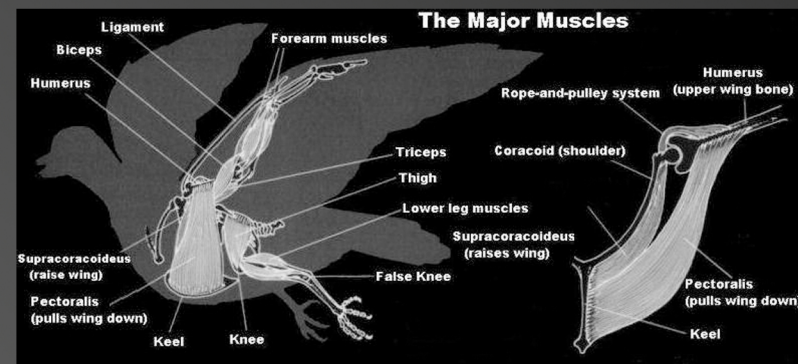
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An anatomical study of bone and muscular structure of winged animals that fly, would lead us to three different branches of animals with shared homology, the bats the birds and the extinct pterosaurs, with different bone and muscle structures, mammal, avian, and reptilian. Even having different bone and muscle structures, they all convey in two things they have wings, and to be capable of using them they have a really developed muscle structure in the thorax area.

*For pseudoscientific evolutionary reasons we should follow the mammal bone structure, since its the most similar to ours, though we could as well look at the avian bone structure. Specially the shoulder blades and the muscles in the thorax area such as the **supracoracoideus** and the **pectoralis**.*

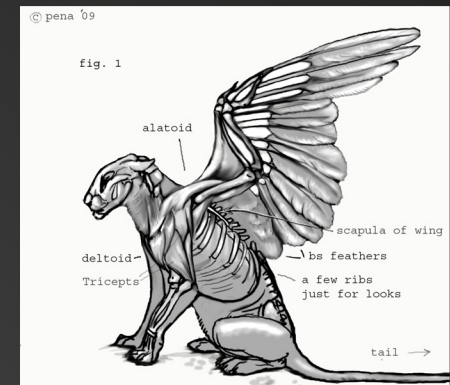
And as well since we are mammals we wouldn't be able to grow wings, so a bird like wingspan would not be as believable as a bat-like wingspan.



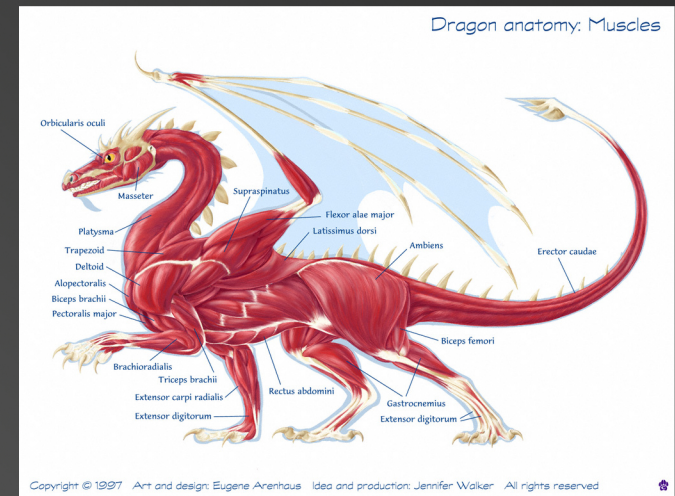
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Some research on fantasy and fictional characters reveals us that little on muscular studies on wing-span credibility is done, usually artists go for the easy way and stick some wings to the back of the character and not being the result of a change in the bone structure or muscular structure.

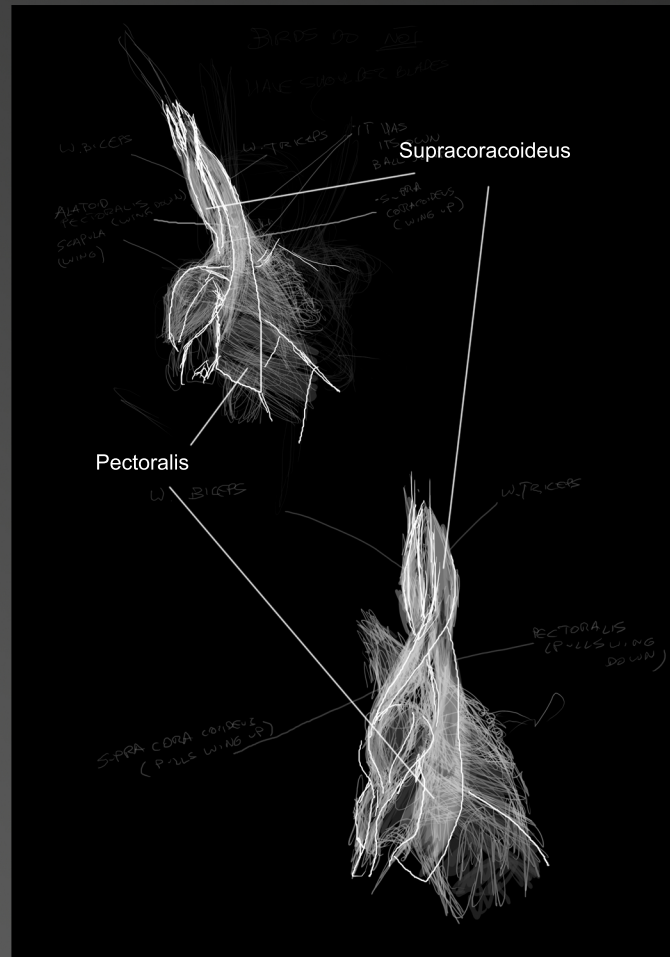
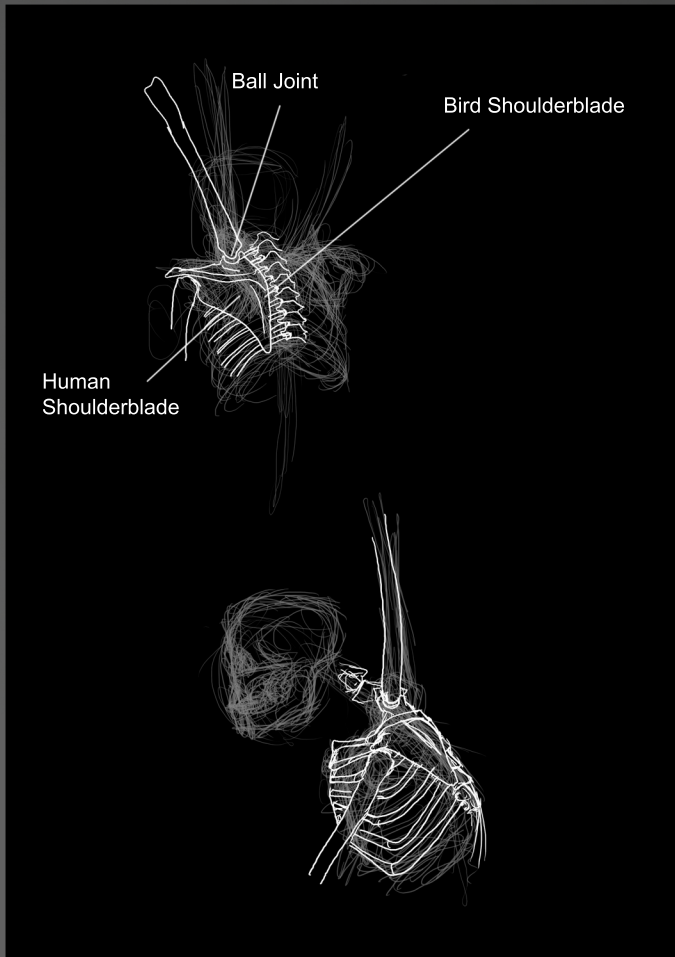


A curious fact is that as odd as it sounds all these creatures have two pair of upper limbs when we think of a winged humanoid, except of the mythological harpy that grew wings on her arms and not in the back.



Fortunately in other cases anatomy studies are made, bringing up plausible and credible anatomy to the fantastical creature enhancing its overall quality.

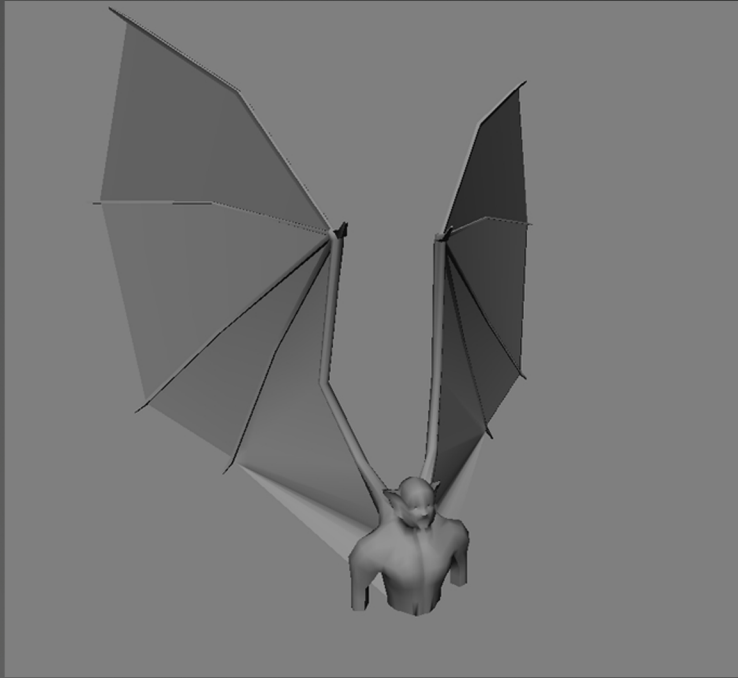
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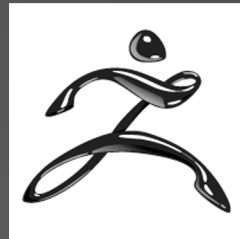
My sketches of the study of altering the bone structure of the shoulder blade, deforming it to allow it to blend into a bird like shoulder blade with a ball joint at the end of it , in order to be able to grow a second pair of arms that will become the wings.

The muscular structure of the chest should be altered as well, to be able to hold two muscles involved in the process of pushing up and down the arms, such muscles are the Supracoracoideus, that raises the wing, and the Pectoralis, that would push the wing down.

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We use a 3d package, XSI, in order to create a rough low polygon version to figure out the volume and the proportions the anatomy of a character with credible wings.



For a more polished approach of the illustration we will use Zbrush

Zbrush is a 2d/3d software, that enables us to sculpt or tweak meshes done in other 3d packages, in a really fast way, allowing to improve significantly the outcome of any 3d modelling work.

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ZBrush's Digital Sculpting system includes a robust set of sculpting brushes. There are many kinds of brushes and many brush controls for each brush. The powerful combination of brush types and controls give you an incredible amount of freedom to create your own brushes to imitate real-world sculpting tools or anything else your imagination can come up with.

A list of the most common used brushes in Zbrush and what they are used for

Standard: The Standard brush is the original basic ZBrush sculpting brush, and when used with its modifiers at their default values, it displaces outward the vertices over which it passes, giving the effect of adding clay to a sculpture.

Move: The Move brush moves points under the brush in the XY plane of the screen. The amount that points are moved depends on brush size and the edit curve. To move an entire model, you can simply increase brush size (or scale the model) so that the brush entirely covers the model.

Inflat: In contrast to the Std brush, which pulls or pushes geometry along the normal of the surface under the center of the brush, Inflat expands geometry by pushing vertices along their own normals. This can be particularly important when you are doing sculpts that displace the surface a large amount with just one or two strokes.

Flatten: Causes the surface under the brush to be flattened; the area may be pushed in or pulled out at the same time. The flatten slider controls how much the area being brushed over will be moved out from the model (positive values) or into the model (negative values). The default of 0 causes the surface being flattened to stay, on average, at its original level. The standard Z Intensity control controls the magnitude of the flattening effect.

Smooth: This brush smooths the underlying surface, and its slider controls the 'direction' of the smoothing effect. If set to a positive number the brush will smooth the recesses of the form more strongly. If set to a negative number it will smooth the high points of the form more strongly. If set to 0, performs a full smooth. For example, set this to 100 to fill a valley containing mountains with silt; the tips of the peaks will be retained.

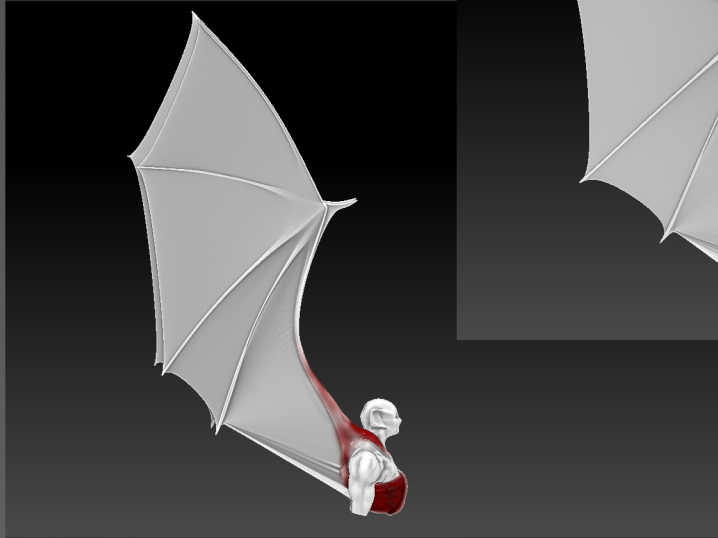
Polypainting

Polypainting allows painting on a model's surface without first assigning a texture map. A texture map can be created at a later time, and the painted surface can be transferred to the map.

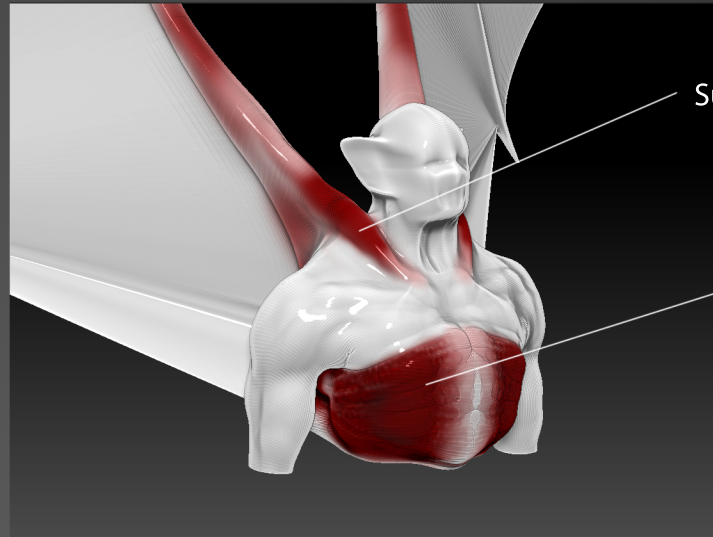
Polypainting offers significant advantages compared to standard workflow:

- The resolution of the texture map need not be decided in advance. This is particularly valuable if you find you need more detailing on an area than you thought you would. Instead of repainting a new, larger texture map, you can simply transfer the existing surface painting to a new, larger map, with no rework necessary.
- Similarly, the UV unwrapping need not be fixed in advance. If one unwrapping proves unsatisfactory, simply create a different unwrapping and transfer the surface painting to that map.
- Removing UVs from your model frees up system resources and allows you to work with more polygons.

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On the final out come from Zbrush, we can appreciate better the muscular structure created for the need of a wingspan, there has been an increase of thorax muscular mass to bring the wings down, caused by the Pectoralis, and a muscular structure surrounding the neck to bring the wings up by the Supracoracoideus



Supracoracoideus

Pectoralis

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As a conclusion, the research of my studies has led me to several interesting facts, scientifically adding muscular mass that allows it to move upwards and downwards anatomically is a big problem, the chest muscle structure should be massive for it to be able to move up and down the wingspan. The wingspan capable of supporting a human being should be at least of 20 square feet of surface area, we should be much lighter, what would become a paradox since we would need to add muscular mass, therefore adding weight, according to what Dr Samuel Poore states in the The Journal of Hand Surgery.

From an artist point of view we can always skip physical barriers that logic science applies, but as well it's good to investigate, research and play with anatomy to add some extra value to the creations we do as artists, and as well, that following logical science could lead us to odd results for the viewer, if followed more logically the chest regions muscles should be much bigger, giving an appearance of breasts or a beer belly, which wouldn't look appealing in any way, so for being an artist allows us to somehow skip those constraints, an artist should be able to convey on a 50% between logic and pure illogical fantasy to achieve credible results.

And technically Zbrush in a combination of any 3d package is a really cheap way of creating acceptable illustrations in 3d without many of the concerns of the usually 3d workflows we have to follow with other of the 3d packages. As well to state that Zbrush used as any other way that doesn't end with an illustration purpose, has a completely different workflow.

By
Juan Pardo Calderon