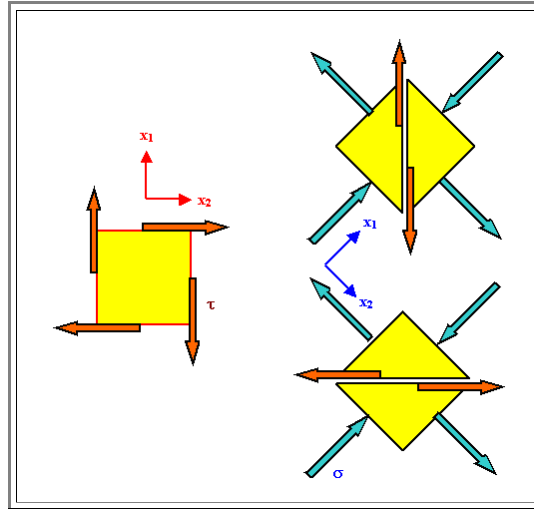


Transformation einer reinen Scherung auf Normalspannungen

Illustration

- The picture below shows how a transformation of the coordinate system can produce pure *shear* stress on the chosen planes of your material for pure *normal* stresses in the new system.
- Since coordinate transformations are not without some problems, let's discuss what we see in the figure.



- The situation on the left is pretty much what we introduced as [pure shear strain before](#). The coordinate system is shown in **red**.
- Now we change the coordinate system to the **blue** one - we rotate the coordinate system by **45°**.
- We do not rotate the body of material, however!** The yellow squares shown are *unit squares of the coordinate system*, not a piece of the material.
- The blue vectors denoting the force that belongs to the stress on the unit square are obtained by using the proper transformation formulae for the stress tensor.
- On the chosen planes of the material *which are the same and not rotated* we have the same shear stress as before. This is most easily realized if we use the ["cutting" procedure](#); shown by dividing the unit square in triangles.
- The forces we need to apply to the surface of the cut is a pure shear force; this is true, as shown, for both orientations.
- Simple vector addition (and taking into account the different size of the areas) tells us that the shear stress τ acting on the "old" plane in the new system is

$$\tau = \sigma$$

- See also the module dealing with the [relation of Youngs modulus and the shear modulus](#), where more detailed information is given.