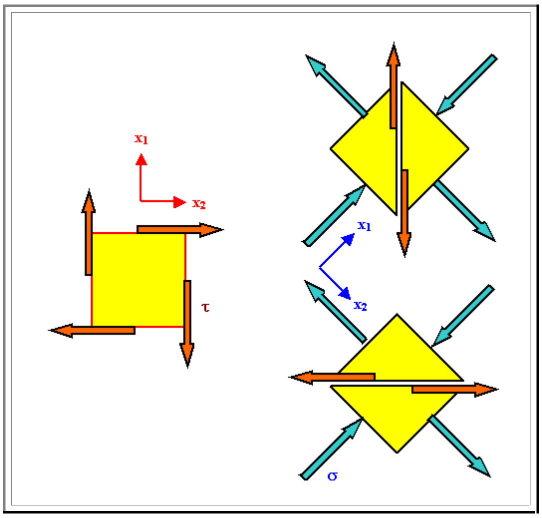
Transformation einer reinen Scherung auf Normalspannungen

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.