If we calculate the phase relations of that same second order resonance system with the equation of phase, we find that for membrane resonance frequencies higher than the stimulus frequency, the phase of the membrane movements equals the phase of the stimulus frequency.

For membrane resonance frequencies that are lower than that of the stimulus frequency, the movements of the basilar membrane show a retarded phase shift of 180°.

The phase for the basilar membrane movement at center frequency is retarded over 90°.

This means that the auditory nerve receives the final signal, almost exclusively, from the contributions in the center frequency region. The contributions of the two flanks however, cancel each other due to their identical amplitude and opposite phase.

This mathematical calculation shows for the logarithmically distributed local resonance frequencies f_c of the basilar membrane, the response characteristic that Ren observed in his experiments on gerbils: a very restricted symmetrical local movement phenomenon, which travels along the basilar membrane.

In our opinion this phenomenon is erroneously interpreted as evidence for a ‘traveling wave’ along the basilar membrane. We argue that it is not a traveling wave, but a ‘phase wave’, that consists of coherent place dependent phase shifted local reactions to a stimulus that is simultaneously present throughout the basilar membrane.