nach: BLACKHAM E. Donnell
The Physics of the Piano
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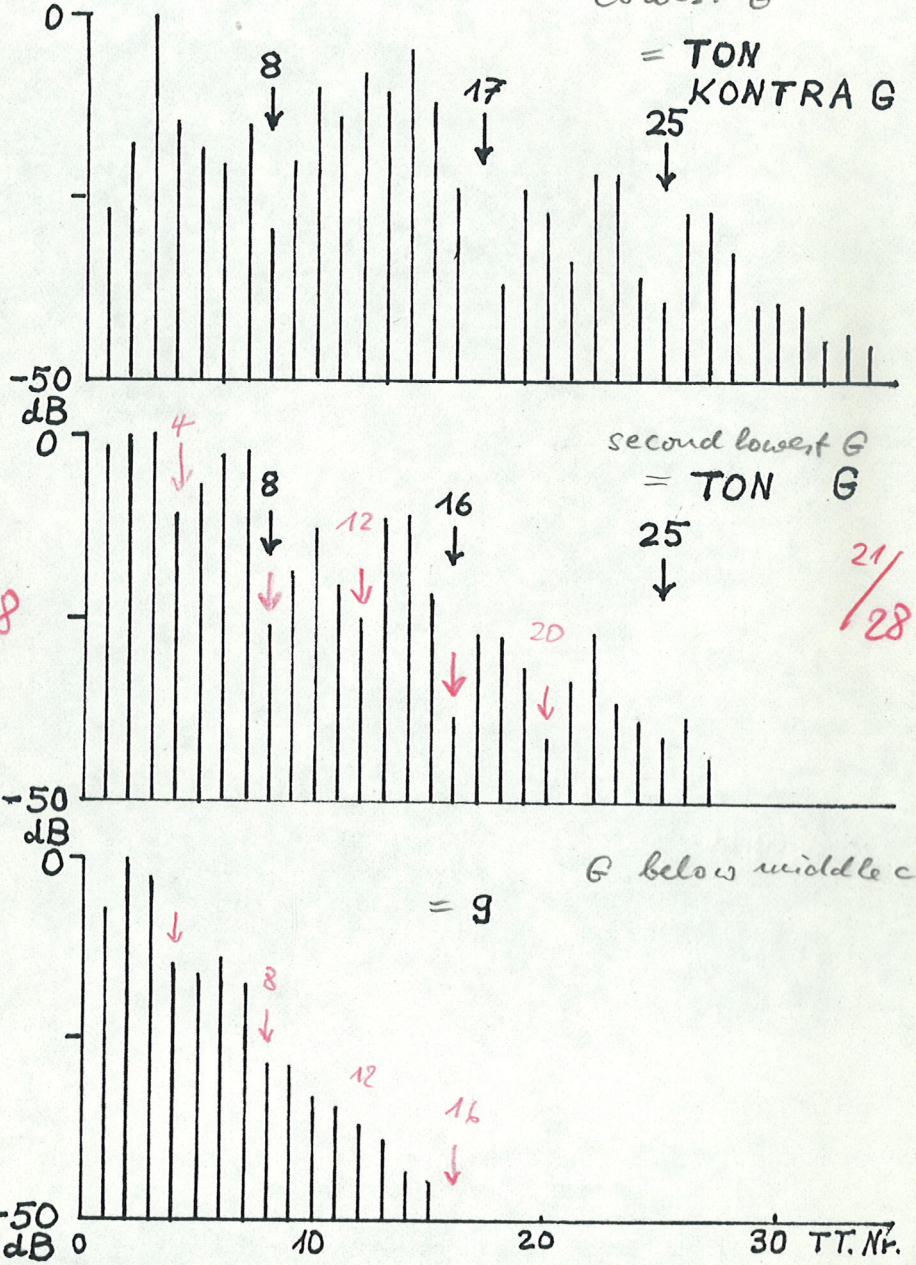
S. 95



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Klavier-Anal. Meyer + Buchmann = 32/25 32/26

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n examination of the decay f individual partials proves that ot the case [*see illustration on ge*]. It is obvious from these hat if the partial structure of a re m[illegible]red at any given time, be [illegible]rent from the structure other time. Nonetheless, some still refer to a decay rate of a o many decibels per second. In the partials do not all decay ame rate; in some cases they n increase in intensity before o decay.

ones used for our decay-time were recorded in an ordinary udio. It was thought at first that gular variations during decay e related to the acoustic characof the room or the piano. Ac- th[illegible]periment was repeated different rooms: a normally re- t studio, a very reverberant d an anechoic, or echoless, . The irregularities in the decay ere present in all three rooms *tration on page 99*].

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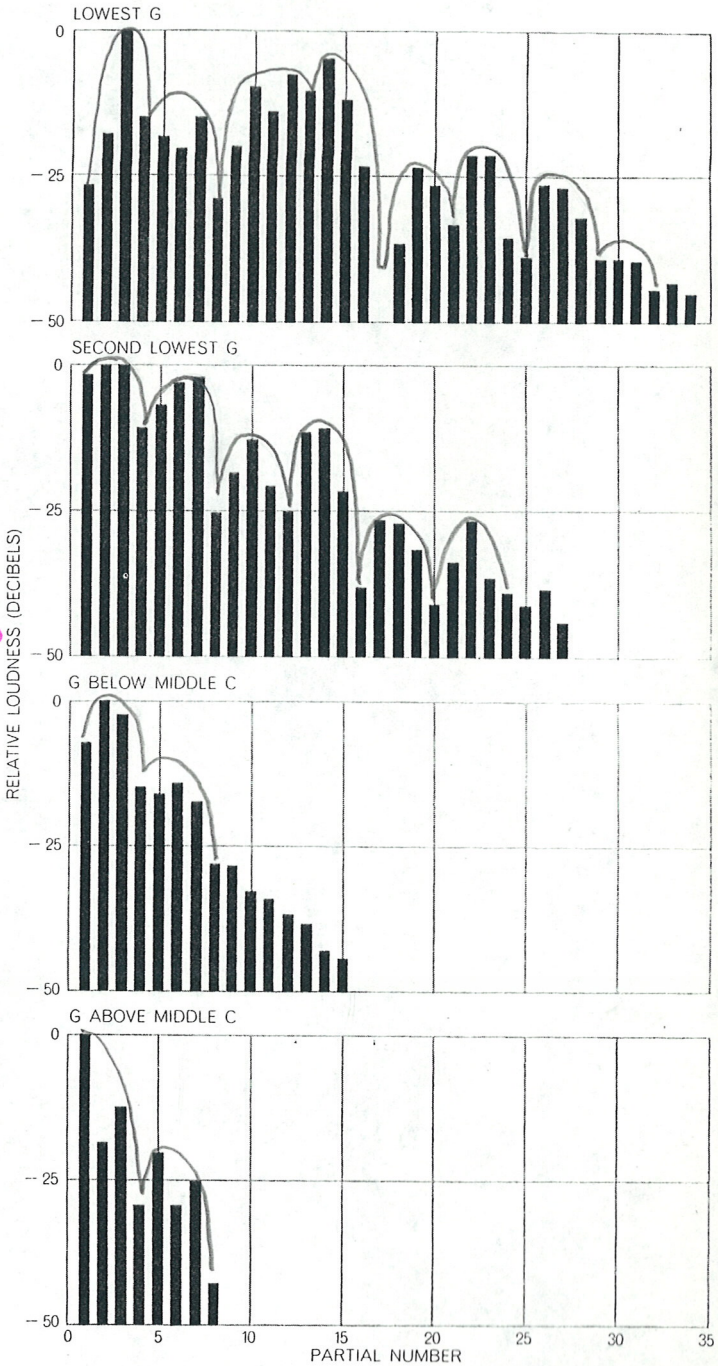
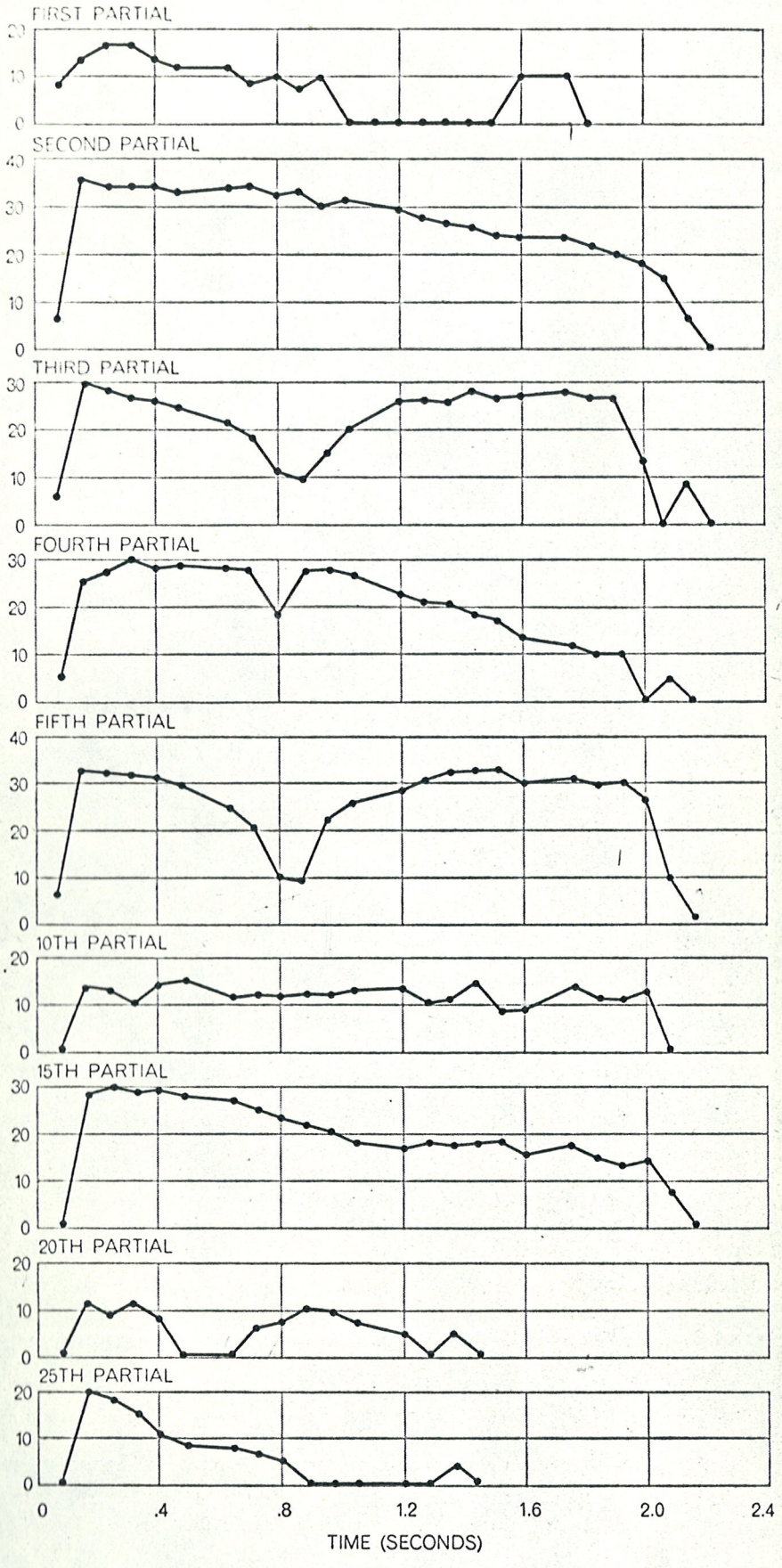
f the main advantages of our netic-tone system is that it can to produce synthetic tones with one another and with ne except for certain selected ristics. For example, a group of tones can be produced that ly in attack time, the time reor the loudness of the tone to first maximum after the hamkes the string. By presenting roup of tones to our jury we e to determine that for the *G* e m[illegible] *C* the attack time has tween zero and .05 second to e the *G* on a piano. An attack ne range of from .05 to .12 sece the note seem questionable, onger than .12 second made it cidedly unlike a *G* struck on a or lower notes the required me tended to be longer; for tes it tended to be shorter.

tic tones can also be produced dentical with one another and al tone in every respect except ne, the time required for the st[illegible]ibrating after it has ts ma[illegible]mum loudness. For an d *G* above middle *C* the decay ired for the synthetic tone to no-like was between two and nds. Again acceptable decay re longer for lower notes and r higher notes.

r procedure is to give synthetic no-like attack and decay but



PARTIAL STRUCTURES of the four lowest *G*'s on the piano keyboard are presented in these four bar charts. The partial structure of a musical tone is the variation in loudness of the partial tones that constitute that particular tone. The partial structures of these four notes were obtained by measuring the maximum response of each partial as it passed through an audio-frequency analyzer that was adjusted to pass only a narrow band of frequencies. The readings are given in relative decibel levels with the loudest partial of each note set at zero; the other partials can then be read as so many decibels below zero.



DECAY CURVES for nine partial tones of the lowest *C* on the keyboard demonstrate that the partial tones of a piano note do not all die away from an initial maximum at the same rate. In some cases they may even increase in loudness before beginning to decay. For each curve 30 measurements were made at equal intervals of .08 second each. Obviously the partial structure of a tone at any given time is different from the structure at any other time.

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