Jones, and trace the sensitivity of the paracusic ear in the presence of a tonal background throughout its course of change; the result might lead us to a better understanding of this phenomenon not only in paracusia but in normal hearing as well.

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REMARKABLE MUSICAL TECHNIQUE OF THE LARGER ANGULAR-WINGED KATYDID

IT is evident that there has been marvelous specialization in the vocal music of the birds, the flute-toned thrushes, including the marvelous hermit, probably leading them all with their tonal embellishments. There has been a parallel specialization among the musical insects of the world. The insects have turned especially to instrumental music, adopting microscopic teeth to be operated upon by a scraping edge as the more common type for their frictional music, in the majority of instances. A mere file-vein and scraper or plectrum to rasp across its teeth seem simple enough as a musical instrument, but even this primitive chitin xylophone offers many possibilities of specialization. It may have teeth of different sizes and spacing, to produce different notes as in the case of certain sound-making ants and beetles, or more than one file-vein may be present on an insect. For the present these specializations of the physical structures of the instrument itself need not be considered. There is a further possibility, and that concerns the technique, the manner of handling the instrument to produce the greatest variety of tones and notes. In the music of man, technique has become the big factor, and marvelous progress has been made in this direction alone by the modern masters over the ancients. In spite of the fact that the crickets have somehow hit upon tonality in their music, and the katydids have not, the latter have nevertheless shown a marvelous specialization in the direction of technique far excelling the crickets. The larger angular-winged katydid has proven himself a master-artist with his xylophone. He has specialized in a manner that makes him a pioneer in his art, at least in our own country. Unfortunately we know too little of the musical behavior of insects elsewhere in the world. This fine katydid, as veritably leaf-adorned as the trees themselves, has somehow learned of the full potentialities of his microscopic file-vein and is making good use of his acquirement. The file-vein is a mere thickened ridge or vein bearing parallel chitin bars or teeth, like the teeth of a comb, these being set practically at right angles to the vein and perpendicular to the surface from which they arise. An almost universal technique among the crickets and katydids is to draw the scraper entirely across this music-file one or more times to produce a note. In the single chirp of a cricket or the intermittent rasp of many katydids, an extremely rapid back-and-forth movement several times delivered produces the sound. The quaver of the cricket-chirp is due to these alternate wing-strokes. In this manipulation all the teeth of the file-vein are used practically simultaneously. The larger angular-winged katydid has somehow gone far beyond this and has learned to produce a long, slow crepitation of thirty to forty or more clicks, making use of the individual teeth, or perhaps sometimes slipping over two or more teeth. The wing-covers along their upper edge are opened nearly three sixteenths of an inch, and set at an angle that will bring the file-vein of the under side of the upper tegmen against the scraper of the upper side of the under tegmen. The scraper is now slowly moved with nice adjustment and precision over the individual teeth, in a gradual closing movement of the wings to produce the long series of individual clicks characteristic of the more typical "song" of this species.

A count of the teeth of the file-vein, including poorly-developed ones at each end of the file, reveals only from fifty-five to sixty teeth, in a length of about three mm. It is probable that not many more than forty to fifty well-developed teeth are present on this file, which would allow not more than an average of one tooth per click in a series of thirty to forty clicks. This is a remarkable specialization in technique and shows the nice control of the katydid in this behavior. It would appear that no other katydid or cricket in our own country has progressed this far in the matter of technique, and we know as yet too little to speak with any authority covering the technique of any foreign species. This katydid not only makes use of this specialized technique, but it has in addition an intermittent zip, produced by striking all the teeth with one quick draw of the scraper across the teeth.

One wonders how this fine katydid sensed this new technique of tapping the chitin-bars of its dorsal, organic xylophone very slowly, to make each tooth emit a note or tone. The most marvelous thing about life, however, is the way it always seems to sense possibilities in every detail of form and function. Once the chitinous xylophone came into being on its wing-covers, once the scraper began to touch the bars to produce a rasp, potentialities were ahead. In the case of the intermittent rasp or zip of this katydid, one quick closing draw produced the note. Slowing down this closing draw of the scraper upon the file-vein was the next step, and some weird prescience of life has in some manner taught the katydid to do just this.

While the crickets have evolved tone in their musical expressions, the matter of technique such as the katydids have specialized upon, seems quite beyond their moods at present. Yet if any of our crickets could strike pure musical tones upon the individual chitin-bars, as the larger angular-winged katydid is attempting to do with its sounds, their tinkling chimes would mark a new era in the spontaneous expressions of insects. A number of the katydids have evolved complicated little instrumental "songs," involving wide departures in time-relations and variety of phrases, from the simple repetitive rhythms of the more primitive type. All this marks some unconscious specialization, it would seem, toward a fuller self-expression with the potentialities of sound.

It is hard to see just how an uncouth and prehistoric scaled-reptilian type should evolve into a beautiful bird, feathered, songful or finally into an inimitable hermit thrush with a soul sensitized for music or pleasurable sounds and whispered tonal harmonies. Yet the lowly insects with their primitive musical instruments, a simple file-vein and scraper, are following the same trend, it would seem. Tonality they have, in the case of the crickets; highly specialized technique and variety they have in the case of the katydids; rhythm and even an ear for synchronous rhythm is evident in both great groups. Is it something unconscious, external and cosmic operating upon life, or is there a subconscious urge, which sooner or later becomes translated into the conscious experience of life? Surely, now are the crickets and katydids conscious of their sound-experiences, but the methods, the genesis of it all constitute a mystery as deep as life itself. The individual seems to have as little to do with it all as the individual cells of our bodies have to do with our own running, our talking, seeing or what-not in body-behavior as a whole. The organic unfolding of the phylum at times seems to be the unit, with the individual functioning as a mere cell in its continuity, but this savors too much of the ultimate meaning of life of which we can have no adequate concept.

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SOCIETIES AND ACADEMIES

THE KENTUCKY ACADEMY OF SCIENCE

THE Kentucky Academy of Science held its fifteenth annual meeting at the University of Kentucky May 12, President Valleau presiding at the general sessions, at one of which Dr. E. C. Stakman, of Minnesota, representative of the American Association for the Advancement of Science to the academy, delivered a very interesting lecture on biologic specialization.

The three divisions, biological sciences, physical sciences and philosophy and psychology, had full programs of papers.

Officers elected were:

G. Davis Buckner, University of Kentucky, *president.*
George D. Smith, Eastern State Normal School, Richmond, *vice-president.*
A. M. Peter, University of Kentucky, *secretary.*
W. S. Anderson, University of Kentucky, *treasurer.*
A. R. Middleton, University of Louisville, *representative* in the council of the A. A. A. S.
Division of Physical Sciences—W. R. Jillson, *chairman;* C. S. Crouse, secretary.
Division of Biological Sciences—G. D. Buckner, *chairman;* E. N. Fergus, *secretary.*
Division of Philosophy and Psychology—R. M. Bear, Centre College, Danville, *chairman and secretary.*

A. M. PETER,
Secretary.

THE NORTH DAKOTA ACADEMY OF SCIENCE

THE twentieth annual meeting of the North Dakota Academy of Science was held at the North Dakota Agricultural College on May 4 and 5. Dr. H. L. Walster, dean of the School of Agriculture of the North Dakota Agricultural College, presented the president's address on the theme "The Pursuit of Science in North Dakota." A notable feature of the program was the showing by Mr. Russell Reid, of the North Dakota State Historical Society, of a series of fifty colored lantern slides showing the beauty spots in western North Dakota and illustrating the characteristics and nesting habits of many North Dakota birds.

In his invitation address on "The Biological Value of Practical Agricultural Experimentation," Dr. J. Arthur Harris, head of the department of botany of the University of Minnesota, urged the point of view that much of the material results from agricultural experimentation could, through careful biometrical analysis and similar studies, be made to yield much material of great value in pure science.

The following officers were elected for the ensuing year:

President—Dr. G. A. Talbert, professor of physiology, University of North Dakota.

Vice-president—Dean R. M. Dolve, school of mechanic arts, North Dakota Agricultural College.

Secretary-Treasurer—Dr. G. A. Abbott, professor of chemistry, University of North Dakota.

Additional members of Executive Committee: Professor J. H. Seymour, Valley City State Teachers' College; Professor C. H. McLees, School of Forestry, Bottineau.

Representative of the North Dakota Academy of Science on the council of the American Association for the Advancement of Science—Dr. H. L. Walster, dean, School of Agriculture, North Dakota Agricultural College.