Pinkus's Haarscheibe and Tactile Receptors in Cats

The recent paper by Tapper on slowly adapting cutaneous mechanoreceptors in the cat (*1*) and a preceding one by Iggo under the title "New specific sensory structures in hairy skin" (*2*), which Tapper quotes, evoke ambivalent emotions. The papers appear to me as fine examples of neurophysiologic investigation and contribute interesting new facts. At the same time, these publications are evidence of the regrettable lack of communication existing between various branches of biologic science. Much has been said about the almost insurmountable difficulties in this area in these columns, and my letter is not meant to be critical, just informative.

From the anatomic and histologic data given in Tapper's and Iggo's publications, there can be little doubt that the "touch spots," which are the structural basis of the physiologic phenomena observed, are identical with the *Haarscheiben* (hair discs), first discovered in man by my father, Felix Pinkus, in 1902 (*3*) and later described by him in a variety of mammalian species, down to monotremes (*4*). They are particularly large in *Pecari* and their dermal bases can be seen with the naked eye in tanned "pigskin" gloves (*5*). These structures were reinvestigated more recently by Tamponi (*6*), Kamide (*7*) and Kawamura (*8*). Their photographs and descriptions of human hair discs are extremely similar to those of Iggo and Tapper and emphasize the large size of the afferent nerve fiber. Winkelmann discussed Haarscheiben in his monograph on nerve endings in skin (*9*) and illustrated their appearance in the cat and the hairless mouse.

I must conclude, then, that neither Iggo nor Tapper has discovered a "new sensory structure," but they have finally elucidated the physiologic function of a long known one—*orbiculus retropilaris* (*10*), an accomplishment that eluded the dermatologists.

HERMANN PINKUS
Department of Dermatology,
Wayne State University College
of Medicine, Detroit 7

References

1. D. N. Tapper, *Science* **143**, 53 (1964).
2. A. Iggo, *Acta Neuroveget.* **24**, 175 (1962).
3. F. Pinkus, *Dermatol. Z.* **9**, 465 (1902).
4. ———, *Arch. Mikroskop. Anat.* **65**, 121 (1904); "Über die Haarscheiben der Monotremen," in *Zoologische Forschungsreisen in Australien und dem malayischen Archipel*, Semon, Ed. (Fischer, Jena, 1906); "Die normale Anatomie der Haut," in *Jadassohn's Handbuch der Haut- und Geschlechtskrankheiten* (Springer, Berlin, 1927), vol. 1, pt. 1, pp. 351–356.
5. ———, *Arch. Dermatol. Syphilis* **169**, 379 (1933).
6. M. Tamponi, *Arch. Ital. Dermatol.* **15**, 378 (1939).
7. J. Kamide, *Japan. J. Dermatol. Venereol.* **65**, 339 (1956).
8. T. Kawamura, *Hautarzt* **5**, 106 (1954); ——— *et al., J. Invest. Dermatol.* **42**, 87 (1964).
9. R. K. Winkelmann, *Nerve Endings in Normal and Pathologic Skin* (Thomas, Springfield, Ill., 1960), pp. 44–46.
10. H. Pinkus, "Die makroskopische Anatomie der Haut," in *Handbuch der Haut- und Geschlechtskrankheiten, Ergänzungswerk*, A. Marchionini, Ed. (Springer, Berlin, in press), vol. 1, pt. 2, pp. 61–62.

24 February 1964

The *Haarscheibe* discovered by F. Pinkus and most recently described by Kawamura and co-workers is similar histologically to the tactile prominences seen in the hairy skin of cats. From the first experiments relating receptor function to anatomic structure, we have had the hair disc of Pinkus in mind. However, from a review of monographs and articles on the skin it would appear that among dermatologists and anatomists there may be a lack of unanimity concerning this structure in cats. I quote Winkelmann [*J. Comp. Neurol.* **109**, 221 (1958)]:

> The tactile hair disk of Pinkus is a structure that is not clearly defined or definitely accepted. Those fibers in the cat's skin which run directly to the epidermis and ramify can give an appearance of the tactile hair disk (fig. 2c). No true relationship exists between the nerve fibers and the skin. The nerve fibers turn and ramify in a deeper plane of focus, yet the superficial appearance is similar to that of the tactile hair disk [p. 223].
>
> The tactile hair disks of Pinkus were not found in the cat's skin. Whether such end-organs exist cannot be stated definitely; however, an end-organ resembling such a structure has been observed in the abdominal skin of the hairless mouse and of the marmoset (unpublished data) [p. 231].

In *Advances in Biology of Skin*, vol. 1: *Cutaneous Innervation* (Pergamon, New York, 1960), Winkelmann and others take great pains to deny the bona fide existence of any anatomically discrete nerve-receptor structure in hairy skin other than those associated with the hair follicle.

I feel, therefore, that Pinkus's statement concerning "the regrettable lack of communication existing between various branches of biologic science" is not pertinent in this instance. I would agree, in general, that such lacks are a serious difficulty today.

DANIEL N. TAPPER
Department of Physical Biology,
New York State Veterinary College,
Cornell University, Ithaca

24 March 1964

Genes and Behavior: A Reply

"Hirsch . . . discusses the one-to-one relation between genes and behaviour." The foregoing allegation by Daniel [*Science* **144**, 80 (1964)] directly contradicts my statement, on the page to which he is referring [*ibid.* **143**, 1439 (1963)], that "heritability is a property of populations and never of behaviors: the relation between behavioral variation and relevant genetic variation is never constant. It must be measured in specific populations under specific conditions, because it varies with both."

Furthermore, Daniel ignores my subsequent discussion on page 1442, which states that "environment . . . is no less important than genetic endowment. . . . the same genotype can produce quite different phenotypes, depending on the environments in which it may develop"—what Erlenmeyer-Kimling and Jarvik (*ibid.*, p. 1477) call "norm of reaction." Also, the phrase "believe in the initial uniformity of individuals," cited by him in quotation marks, does not appear in my article; though I might accept that phrase as expressing some of the intent of my argument.

JERRY HIRSCH
Department of Psychology,
University of Illinois, Urbana

13 April 1964