

Correction

## Ridgeology - Animal Muzzle Prints and Human Fingerprints

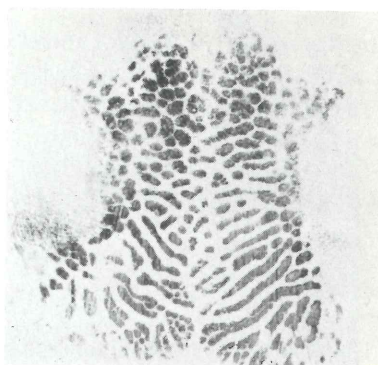
*John R. Vanderkolk*

*Indiana State Police Laboratory  
Fort Wayne, Indiana*

On page 278 of the July/August, 1991, (Volume 41, No. 4) issue, the photograph contained in Figure 7 was printed in error. Figures 7 and 8 are hereby presented with the correct photographs. The editor offers his most sincere apologies to the author and readers for this inconvenience.



*Figure 7*



*Figure 8*

*Figures 7 and 8 were made by the same cow. The relative sizes, shapes, arrangements, and alignments of ridge units and relative pore positions (if visible) within the ridge units should be noted.*

# Ridgeology - Animal Muzzle Prints and Human Fingerprints

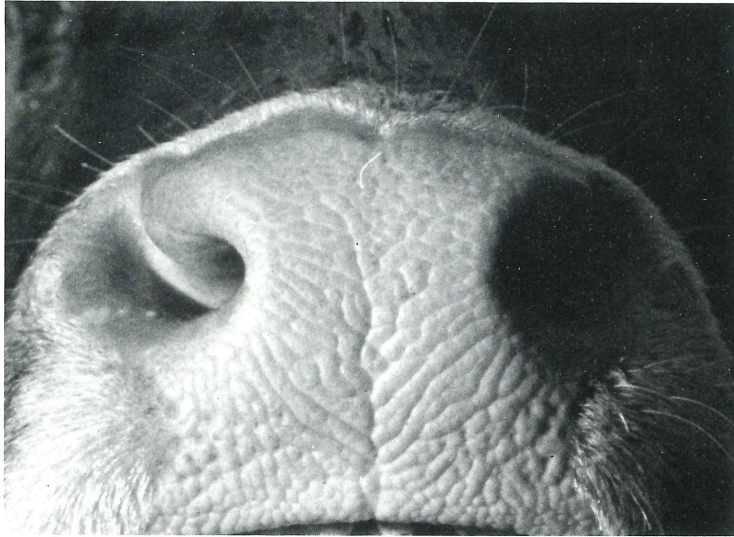
*John R. Vanderkolk*

*Indiana State Police Laboratory  
Fort Wayne, Indiana*

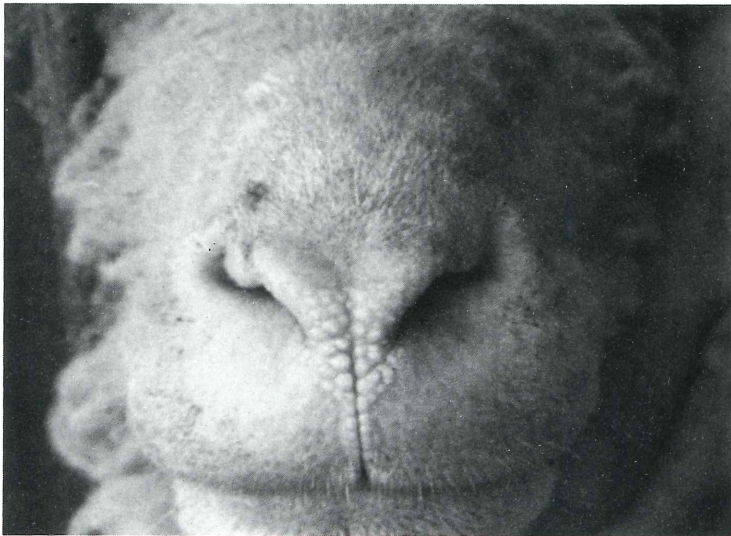
Is it possible to identify some animals' muzzle (nose) prints in a similar manner to the way a person's fingerprint can be identified? As a latent print examiner for the Indiana State Police, I was asked this question in 1985 by Roger Sherer, Extension Agent, Youth, for Wells County, Indiana. If muzzle prints could be used for identification purposes, I was then asked if I would conduct comparisons of ink nose prints of cows and sheep for the Wells County Fair.

One of the purposes of the fair is for children to raise animals for prizes and market auction sale. Although the children are supposed to show the animal they raised, the prizes and large amounts of auction sale money involved have prompted instances of switching or misrepresentation of an animal prior to the fair. For example, in 1989, at the Ohio State Fair, the Grand Champion steer was suspected of actually being a steer from Illinois that was misrepresented as a steer raised in Ohio. Dye had been applied to cover some light hair on this steer when it was shown at the Ohio fair. The contestant forfeited a \$28,000 auction prize because of the allegation even though the steer's true identity was never proven. No nose print standards had been taken earlier [1]. In Indiana, cows and sheep are nose printed months before the fair, then the winners are re-printed and compared to the earlier obtained standards.

In order to respond to Agent Sherer's inquiry and not knowing much about nose prints, I talked to Bob Hazen of the FBI. Bob Hazen did not have much information on nose prints but he did remind me of the concept that nature is never reproduced exactly [2]. Soon I contacted Rex Warner, State 4-H Representative, Extension Specialist 4-H, Youth, Indiana. I examined Warner's statewide file that consists of thousands of cow and sheep nose prints [3]. After

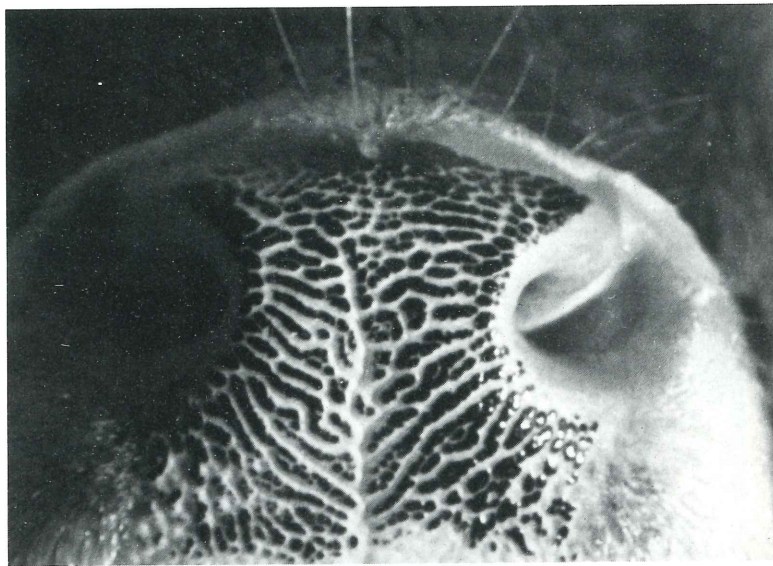


*Figure 1*

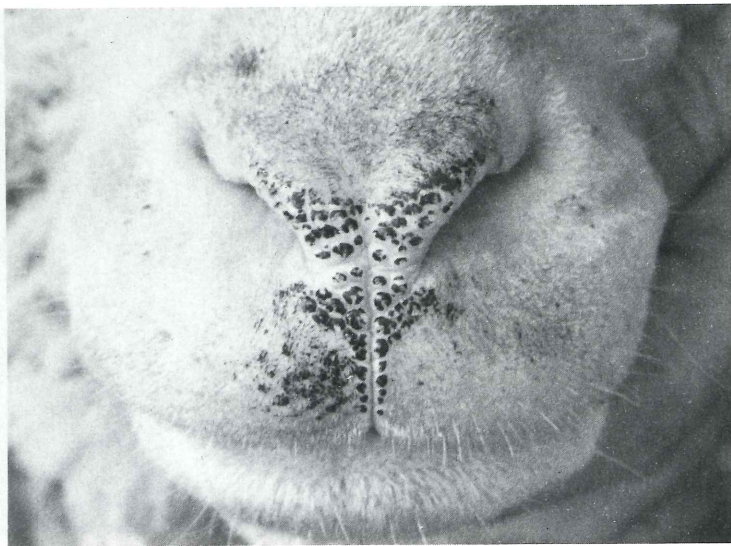


*Figure 2*

*Ridge unit arrangements on the muzzles (noses) of a cow (Figure 1)  
and a sheep (Figure 2)*



*Figure 3*



*Figure 4*

*After securing the animal, the muzzle (nose) is dried with a towel and standard fingerprint ink is applied with a roller or plate. Figures 3 and 4 show ink applied to the summits of the ridge units.*

my study  
reproduc

I also  
inking t  
pressing  
each nos  
very coo  
at the W

"The  
been the  
1924; Z  
ces with  
epiderm  
demarca  
of ordin  
well as t

"Som  
accordi  
claimed  
suggeste  
(Peterso

"But  
no essen  
the pec  
chromos  
is establ  
time." [

Upon  
obtained  
sizes an  
remaine  
As long  
enough  
ever, as  
evaluati

I hav  
Wells C  
with the  
the ridg

my study of the file's contents was completed, the concept that nature is never reproduced exactly was reinforced.

I also began to practice obtaining ink nose prints by drying the animal's nose, inking the nose with an inked roller or flat glass inked plate, then lightly pressing a white card against the nose. Numerous impressions were taken of each nose until suitable detail could be observed. Most of the animals were not very cooperative. Based upon my preparations, I agreed to compare nose prints at the Wells County Fair as a learning experience. (Figures 1-4)

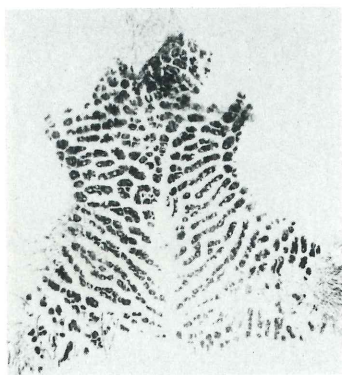
"The morphology and structure of the skin of the muzzle in adult bovines has been the object of careful studies by several workers (Kormann, 1906; Littwitz, 1924; Zimmerman, 1934; Simon, 1951) who pointed out its structural differences with respect to other cutaneous regions, namely, the marked thickness of the epidermis displaying a well developed horny layer; the presence of small areas demarcated by grooves; the conspicuous height of dermal papillae; the absence of ordinary hairs and the presence of blood-sinus hairs in restricted areas, as well as the presence of numerous and typical salivary glands.

"Some workers, on the basis of the fact that the cutaneous areoles differ according to each individual, though remaining unchanged throughout life, have claimed that the muzzle is analogous to the digital pads in man and have suggested that it might be used for the identification of single individuals (Peterson, 1922; Baker, 1923; Salomon, 1930)." [4]

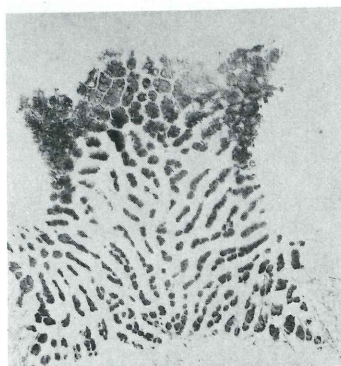
"But, will the muzzle features change with age? Except for growth in size, no essential modification on the muzzle pattern is expected for the reason that the peculiarities of the muzzle, like any organ in the body, are determined chromosomally as early as in the zygote state. So that, once the muzzle pattern is established, it becomes fixed and will remain unaltered with the passage of time." [5]

Upon comparing the winners' nose prints obtained at the fair to the standards obtained two to seven months earlier, it became apparent to me that the relative sizes and shapes and arrangements of the ridge units (cutaneous areoles) remained permanent except for the growth that occurred during that time period. As long as the initial standard and current impression were relatively clear enough and displayed sufficient detail, an identification can be effected. However, as with human inked prints and latents, each impression required an evaluation for suitability. (Figures 5-12)

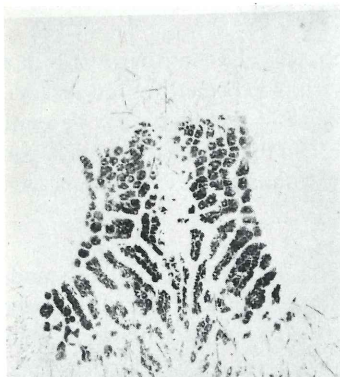
I have been conducting comparisons of cow and sheep nose prints at the Wells County Fair each summer since 1985 and have found nothing to disagree with the concept that the relative sizes, shapes, alignments, and arrangements of the ridge units on the noses of cows and sheep are unique and permanent. I have



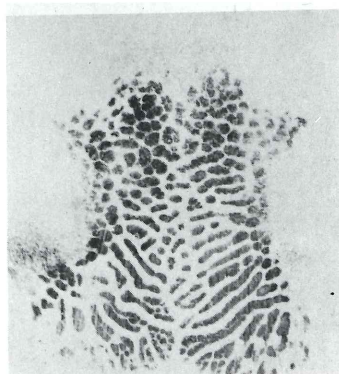
*Figure 5*



*Figure 6*

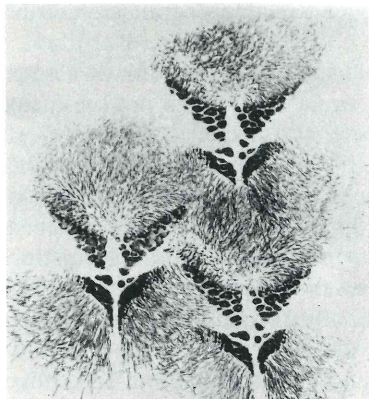


*Figure 7*

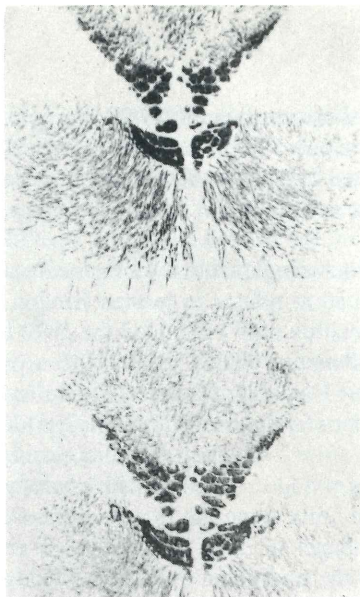


*Figure 8*

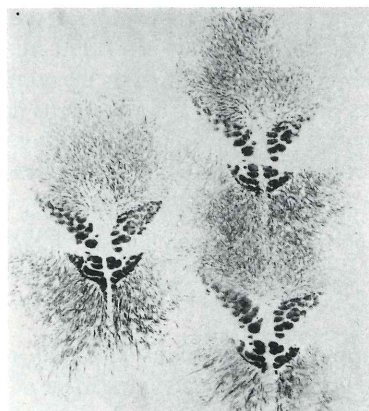
*After the nose is inked , it is pressed with a white card. Figures 5 through 8 show the noseprints of three different cows. Figures 7 and 8 were made by the same cow. The relative sizes, shapes, arrangements, and alignments of ridge units and relative pore positions (if visible) within the ridge units should be noted.*



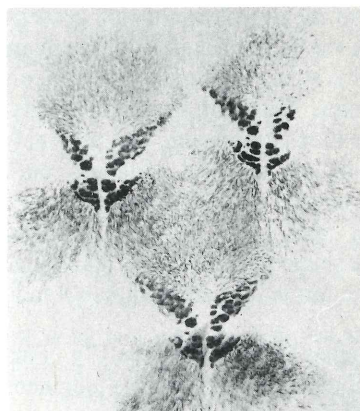
*Figure 9*



*Figure 10*



*Figure 11*



*Figure 12*

*After a sheep's nose is inked, it is pressed with a white card. Numerous recordings may be needed to get clear detail. Figures 9 through 12 show the noseprints of three different sheep. Figures 11 and 12 were made by the same sheep. The relative sizes, shapes, arrangements, and alignments of ridge units and relative pore positions (if visible) within the ridge units should be noted.*

identified approximately 20 cow and 50 sheep nose prints at the Wells County Fair since 1985. In 1990 I attended the Indiana State Fair, randomly nose printed five cows and five sheep, then compared them to the standards obtained earlier. Once again I found nothing to disagree with this identification method.

Those engaged in the fingerprint science may wonder how animal nose print evaluation relates to human friction ridge evaluation. I did not see a strong correlation until I attended the 1990 International Association for Identification Conference. While listening to a presentation by David R. Ashbaugh of the Royal Canadian Mounted Police and after reading his article, "Ridgeology, Modern Evaluative Friction Ridge Identification," it became apparent to me that nose print evaluation is more closely related to ridgeology than to traditional friction ridge evaluation. Ridgeology stresses the alignment or misalignment of ridge units along the ridges, and incorporates the recognition and utilization of the shapes of ridge unit edges and relative position of pores. When combined with the traditional evaluation of ridge endings, bifurcations, and dots, ridgeology uses all the detail visible in the ridge. Ridge units are the individual papillary growths of skin around each pore. Sheep have ridge units of various sizes, shapes, and arrangements that don't tend to fuse together, cows have ridge units that might fuse together, and people have ridge units that have a tendency to fuse together. Ridgeology is the basis for nose print identification.

Since nature is never reproduced exactly, should ridge units be evaluated as part of the overall evaluation process for latent print examinations? According to David R. Ashbaugh [6], "There are hundreds of ridge units in a small area of friction skin. The number of ridge units present can be identified by the number of pores. Each unit is approximately as long as it is wide. All ridge units have been subject to genetic and physical pressures while growing. The plethora of genetic and physical variances, during friction ridge formation, is the reason why no two areas of friction skin will ever be found to be the same, even in a small area. The variables involved are far too great." Also, "Alignment, misalignment, or shape of individual ridge units create discernible formations. These formations are immutable and unique but are not minutiae."

Stated by David Grieve [7], "Final determination of identity resulting from the comparison process is a judgment based upon a combined assessment of the qualitative and quantitative analyses. While an identification is often described in terms of the number of matching points, the conclusion is formed by observation of the entire latent impression. In the areas that lack individual characteristics are informational elements which can support the decision. In addition to establishing the relationship of the individual characteristics, continuous ridge structures provide contours and thicknesses that often can be correlated for similarity. Creases, minute breaks, scar tissue, prominent pores, and any other detail which is not traditionally designated as an individual characteristic but is distinctly unique to the impression must be noted as to agreement or disagree-



ment with the standards. In most latents, the percentage of the entire impression that contains the points of identity is small, whereas the remaining ridge structure, without benefit of accepted nomenclature, is the substance of the impression. Examiner approach which ignores the construction of the complete print will continue to make points 'fit'. The attitude that considers all qualitative informational elements as part of the comparison process maintains scientific approach."

And according to R. A. Huber [8], "When any two items contain a combination of corresponding or similar and specifically oriented characteristics of such number and significance as to preclude the possibility of their occurrence by mere coincidence, and there are no unaccounted for differences, it may be concluded that they are the same, or their characteristics attributed to the same cause."

### Summary

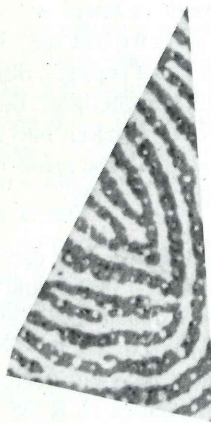
Since human friction ridge formation and arrangements of ridge endings, bifurcations and dots have been found to be permanent and unique, the formation and arrangements of the ridge units that make up the ridges must also be permanent and unique. All the informational detail present in latent and ink prints should be evaluated. There is no reason to ignore what we can see. We should not limit ourselves to a quantity of only traditional ridge endings, bifurcations and dots. Often an ink and/or latent print will be smudged, faint, underdeveloped, or overdeveloped. These possibilities must be taken into account when making the evaluation. My experience with animal nose prints has given me a better understanding of Ashbaugh's concepts of ridgeology.

Cow and sheep nose print ridge unit arrangements are unique and can be evaluated. Ridge units along the ridges in human latent and ink prints should be evaluated. After all, if you can see the detail, why not evaluate it? Can I identify a latent print using ridgeology? As Pat Wertheim [9] stated at the 1989 IAI Conference in a presentation referring to what is needed for identification, "Show me the print". In a 1990 IAI Conference speech, Charles H. Roth, Jr. [10], stated he might be able to eliminate a latent print having few minutiae points. My question is, might he be able to identify that same latent print to someone else through ridgeology? He may want to see the print.

An example of the principles of ridgeology may be observed by examining the 1985 ink print in Figure 13 and the 1990 latent print in Figure 14. The latent print in Figure 15 has areas highlighted showing unique arrangements and shapes of ridge units. Other distinguishable ridge units may be found. If nature is never reproduced exactly, as has been accepted for traditional evaluations,



*Figure 13*  
*An inked print taken in 1985*



*Figure 14*  
*Portion of latent*  
*print shown in*  
*Figure 15*



*Figure 15*  
*Latent print from 1990*

*The latent print in Figures 14 and 15 was deposited and developed with magnetic powder in 1990. Ridge units highlighted in Figure 15 may be noted. Other ridge unit and pore arrangements may be found.*

then nature can never be reproduced on an even finer level, that is, ridge unit arrangements.

### Acknowledgements

I wish to thank Dr. Melvin Stromberg, D.V.M., Department of Anatomy, School of Veterinary Medicine, Purdue University, West Lafayette, Indiana, for his help in locating many articles dealing with muzzle printing. I would also like to thank Mr. Dan Winans of Wood's Locker Service, Zanesville, Indiana, for allowing me access to his slaughterhouse to document cow muzzles, and to Mr. Ed Moritz of Bluffton, Indiana, for allowing me to document his sheep muzzles. Also Dr. John Huseman, D.V.M., Bluffton, Indiana, and Dr. Cornelius Vanderkolk, D.V.M., Oxford, Indiana, were instrumental in making contacts for me. Roger Sherer and Rex Warner were most instrumental in getting me interested in nose prints and allowing me access to their files. And David Ashbaugh's 1990 speech was the catalyst that encouraged me to look closer at latent prints.

For further information, contact:

John R. Vanderkolk  
Indiana State Police  
Fort Wayne Regional Laboratory  
5811 Ellison Road  
Ft. Wayne, IN 46804  
(219) 432-8661

### References

- 1 Lewis, B., (Associated Press), "Steer's Dyed Hair Costs Teen Prize", *Journal Gazette*, Fort Wayne, IN, September 22, 1989.
- 2 Hazen, R., Federal Bureau of Investigation, Washington, DC, personal communication, 1985.
- 3 Warner, R., State 4-H Representative, Purdue University, West Lafayette, IN, personal communication, 1985.
- 4 Barasa, A. and P.R. Tardy, "Morphogenesis and Histogenesis of the Muzzle Prints in Bovines", *Journal of Anatomy and Embryology* (Engl. Trnsl.), 133, 1971, *Zeitschrift Fur Anatomie Und Entwicklungsgeschichte*, p 37.
- 5 Solis, J.A. and C.P. Maala, "Muzzle Printing as a Method for Identification of Cattle and Caraboas", *Philippine Journal of Veterinary Medicine*, 14 (1), 1975, p 7.
- 6 Ashbaugh, D.R. "Ridgeology", *Journal of Forensic Identification*, 41 (1), 1991, pp 35, 45.

- 7 Grieve, D.L., "The Identification Process: Attitude and Approach", *Journal of Forensic Identification*, 38 (5), 1988, pp 220-221.
- 8 Huber, R.A., "The Philosophy of Identification", *R.C.M.P. Gazette*, July/August, 1972.
- 9 Wertheim; P., "Qualifying as an Expert Witness: Designing a Set of Questions to Assist in Court Testimony", *Journal of Forensic Identification*, 40 (2), 1990, p 66.
- 10 Roth, C.H., Jr., "Confessions of a Hired Gun - Perspectives of an Expert Who Has Served the Prosecution and the Defense - a Comparison", presented IAI Conference, Nashville, TN, 1990.

### *Bibliography*

- "An Analysis of Standards in Fingerprint Identification", *FBI Law Enforcement Bulletin*, June 1972.
- Ashbaugh, D.R., "The Key to Fingerprint Identification", *Identification News*, 35 (7), 1985, pp 13-15.
- Bush, V.C., Washington Post Staff, "Experts Look to the Noses to Keep Steers Straight", *Washington Post*, August 22, 1990, pp C1,C5.
- Cummins, H., "Loss of Ridged Skin Before Birth", *Finger Print and Identification Magazine*, 44 (8), 1965, pp 3-7,23.
- Jolly, J.S., "Is this Enough", *Identification News*, 36 (11), 1986, pp 11-12.
- Krupowicz, T.E., "Frictional Ridges, Characteristics, the Identity Factor", *Identification News*, 36 (3), 1986, pp 3, 6-9.
- Pandney, S.N., "Muzzle Printometry in Bovines", *Indian Journal of Animal Science*, 49 (12), 1979, pp 1038-1042.
- Pandney, S.N., "Note on Muzzle Printometry for Determining Age of Cattle", *Indian Journal of Animal Science*, 52 (11), 1982, pp 1102-1104.
- Pandney, S.N., "Note on the Ridges of Cattle Muzzle Prints", *Indian Journal of Animal Science*, 52 (11), 1982, pp 1104-1107.
- Putter, P.J., "Nose Prints on Cattle", *Fingerprint Whorld*, 6 (24), 1981, pp 90-91.
- Putter, P.J., "An Investigation to Ascertain Whether Muzzleprints of Cattle Can Be Individualized by Applying the Same Techniques as Those Used in Dactyloscopy", *Fingerprint Whorld*, 6 (27), 1982, pp 55-59.
- Sherer, R., Extension Agent - Youth, Bluffton, IN, personal communications 1985-1990.