

POSSIBILITIES OF MATHEMATICAL NON-LINEAR-  
DYNAMICS-METHOD APPLICATION IN  
LABORATORY BIOPHYSICAL EXPERTISE

*Anna A. Oleshkevich, Svetlana A. Komarova,*

*Anna V. Novikova*

[kaffizmgavmib@mail.ru](mailto:kaffizmgavmib@mail.ru)

# RAD 7

**SEVENTH INTERNATIONAL CONFERENCE  
ON RADIATION IN VARIOUS FIELDS OF RESEARCH**

June 10-14, 2019 | Hunguest Hotel Sun Resort | Herceg Novi | Montenegro



*Moscow State Academy of Veterinary  
Medicine and Biotechnology – MVA  
by K. I. Skryabin (Moscow SAVMB)*

<http://www.mgavm.ru>

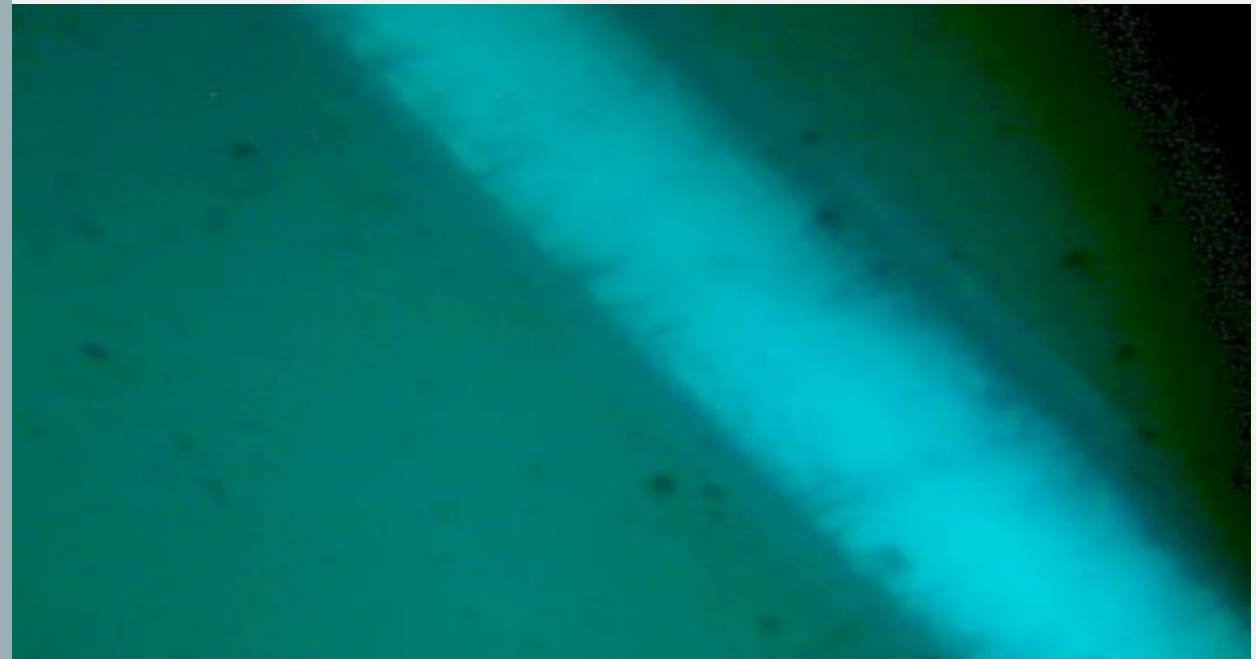
## ***MATERIALS AND METHODS***

The experimental work was carried out at the Department of Information Technology, Mathematics and Physics of Moscow State Academy of Veterinary Medicine and Biotechnology.



## AIM OF THE WORK

The aim of the work was to study the perspective of experimental biophysical methods' attracting for the solving the problem of wool examination

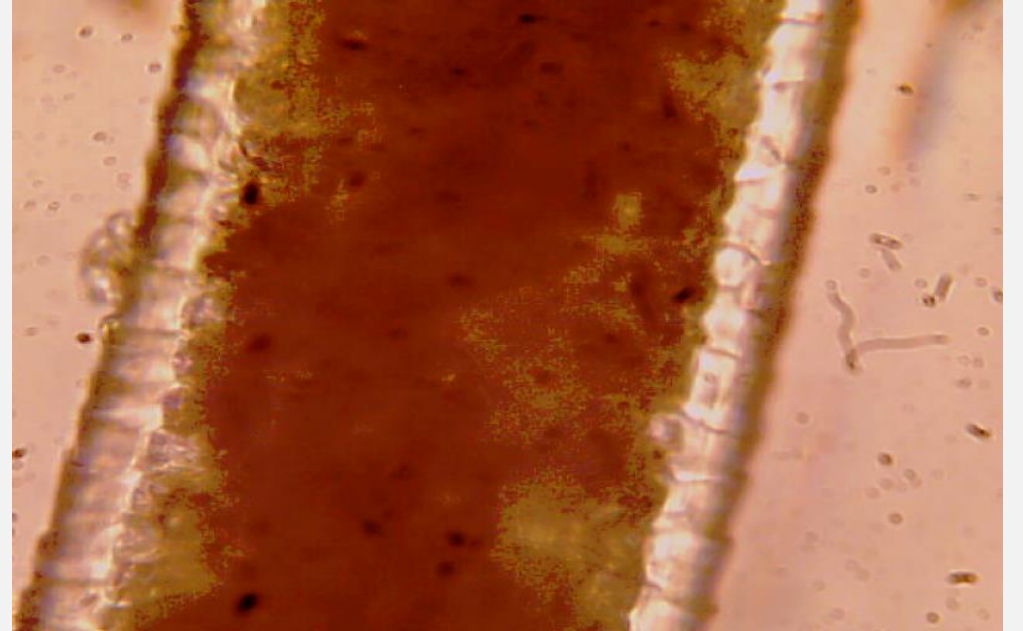



# OBJECT OF STUDY

The object of our study was a native animal hair. Part of the hair samples was obtained in the forensic biological examination laboratory at the Ministry of Justice of the Russian Federation, part of the hair (goats) was obtained from live animals from a farm in the Noginsky district of the Moscow region

## HAIR

The study was carried out both in guard and down hair, cut with scissors at the level of leather, which ensured the presence of all parts of the hair in the object.





THE  
OBJECTS  
OF THE  
STUDY  
INCLUDED:

- 1. The ability to use to identify hair microscopy in reflected light.
- 2. The possibility of using the software package "HarFA 5.1" for processing the obtained micrographs.

THE OBJECTS OF THE STUDY INCLUDED:

The authors explored the possibility of fluorescence microscopy methods using in conjunction with the methods of mathematical non-linear dynamics to determine the species of animal hair.





SOFTWARE  
PACKAGE  
“*HARFA*”

In the software package “*HarFA*”, by determining the regression equations and constructing the corresponding graphs and histograms, we conducted a fractal analysis of the images of animal hair using the method of A.A. Oleshkevich and co-authors

SOFTWARE PACKAGE  
“*HARFA*”- METHOD

[RF patent for invention  
№ 2640177].

This method allows to  
take micrographs of hair  
and to carry out their  
fractal analysis using the  
“*HarFA 5.1*” software  
package

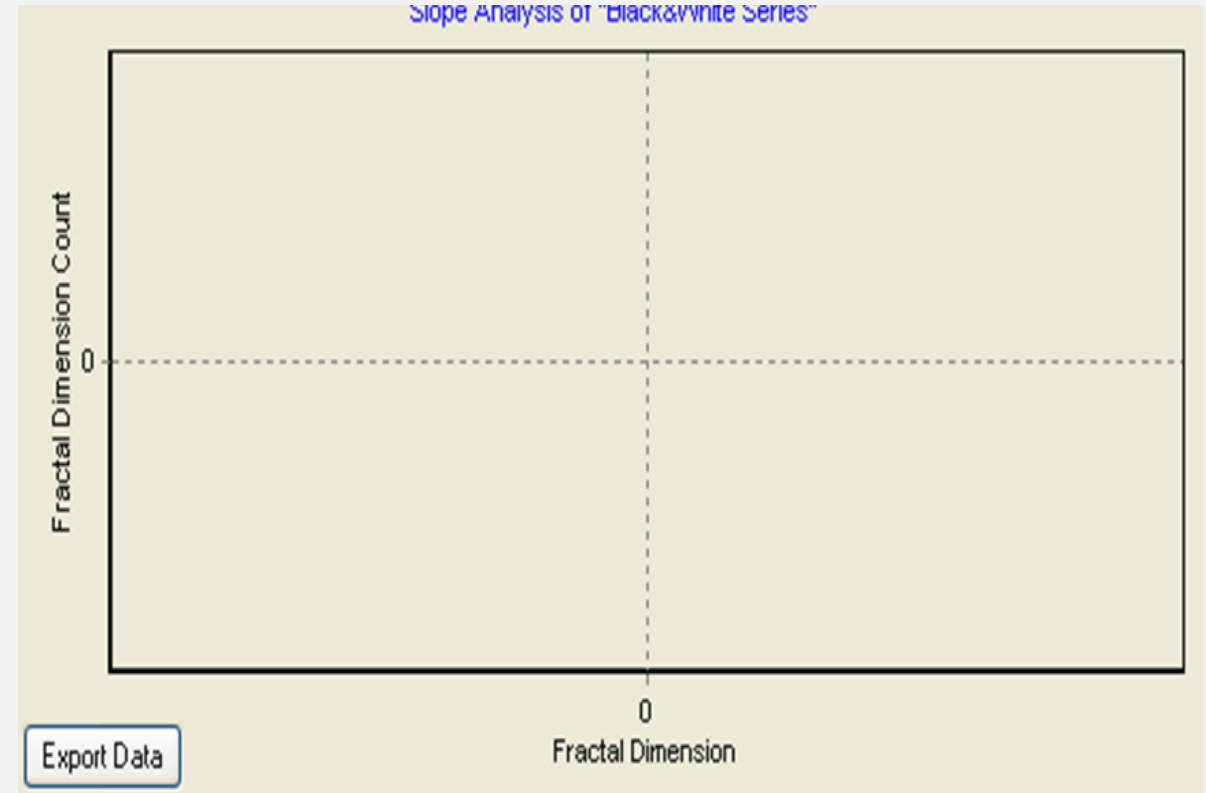
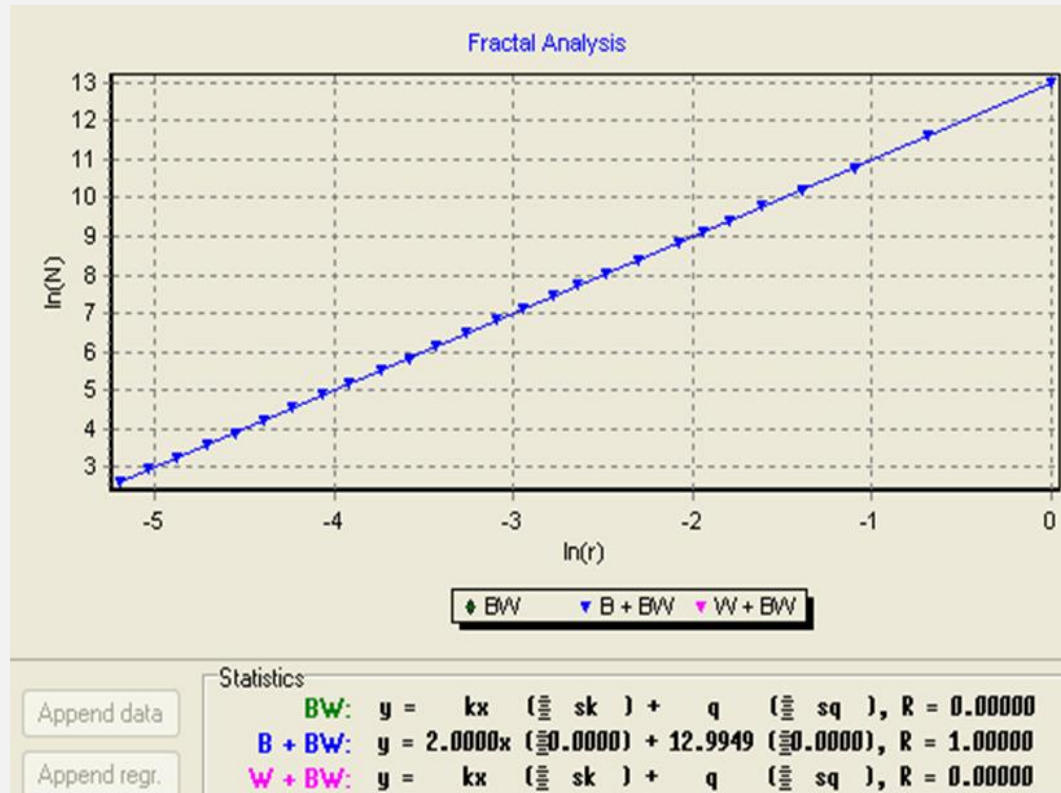
MICROPHOTOGRAPH  
OF HAIR IN  
REFLECTED LIGHT



# FRACTAL ANALYSIS OF MICROGRAPHS OF POLAR BEAR HAIR IN REFLECTED LIGHT:

## A - GRAPHS AND REGRESSION EQUATIONS

### B - HISTOGRAM



## RESULTS

- The analysis shows that the use of light microscopy-method is not informative.
- There is no any fractal structure of the object in the figure
- There are no specific differences in the histograms
- Coefficients of the fractal dimension are absent.
- Comparison of the analysis of hair in reflected light with the results of fractal analysis revealed a great information content of the method.
- The materials obtained show that the use of microscopy in reflected light could not identify a kind of animal hair.