Skeletal Structures in the Images of Cosmic Dust Clouds and Solar System Planets

Valentin A. Rantsev-Kartinov

***Abstract*—Multilevel dynamical contrasting of cosmic dust cloud images reveals the presence of skeletallike structures that are similar to those found in various electrical discharges and in space plasmas. These results, which are concentric cylinders in interstellar space, corroborate the discovery of interstellar neutral hydrogen (HI) emission spectra that are recorded in radio astronomy from low- and high-velocity intergalactic clouds in which the critical ionization velocity effect plays a role in the formation of coaxial or twisted plasma filaments. The nanodust assembled "skeletons" are similar to that observed by Voyager 1 images of solar system planets that show the filaments aligned perpendicular to the ecliptic plane.**

***Index Terms*—Cosmic dust, filaments, fractal, planets, self-similarity, skeletal structures (SSs), solar system.**

I. Introduction

MULTILEVEL dynamical contrasting (MMDC), a non-statistical analytical method, is based on variable computer contrasting of a recorded image obtained photographically by hologram, or by radio or optical astronomy [1]–[7]. MMDC analysis resolves images into a wide range of length scales, for example, in laboratory high-current electric discharges [3], the Earth's atmosphere, and in space [4]. This analysis has revealed the presence of skeletal structures (SSs; concentric cylinders), presumably composed of nanodust [5]. Similar structures have been found in MMDC transmission and scanning electron microscopy images of carbonaceous film deposits collected in the vacuum chamber of tokamak T-10 [6]. These structures all show a self-similarity tendency behavior. Typical SSs consist of separate but identical blocks forming a unified network. The following two types of such blocks are found: 1) coaxial tubular structures (CTSs), which are sometimes with internal radial bonds and 2) cartwheel-like structures (CWSs), which are located either on their own axes or on the butt ends of the CTSs.

The filaments in SSs consist of straight rigid almost identical block CTSs which are connected flexibly as in a joint of a skeleton. In [3] and [4], it was shown that such bonds can exist due to stringing of individual blocks along a common magnetic flux (as beads on a cord), which penetrates dusty filaments. Thus, the blocks are interacting magnetic dipoles. Such SSs, which are composed of nanodust, may be located both in an ambient plasma or vacuum.

Manuscript received October 2, 2006; revised March 21, 2007. This work was supported by the Russian Foundation for Basic Research under Project RFBR 05-08-65507-a.

The author is with the Institute for Nuclear Fusion of the Russian Research Center (INF RRC) "Kurchatov Institute," Moscow 123182, Russia (e-mail: rank@nfi.kiae.ru).

Color versions of one or more of the figures in this paper are available online at http://ieeexplore.ieee.org.

Digital Object Identifier 10.1109/TPS.2007.897571

II. SSs in Cosmic Dust Clouds

A. 100-μm Observations

The analysis used the MMDC databases from project "Dusty-Full-Sky;" maps of emission of cosmic dust clouds in the 100-μm wavelength range showing the presence of SSs (Fig. 3).

The topology of SSs (Figs. 2–7) appears identical to that found previously [1], [2]. Figs. 4 and 5 illustrate the phenomena that was formerly found in the analysis of the images of laboratory plasmas and cosmic objects, namely, electric torchlike structures [3]. These are also seen as a rectilinear dark filament with a shining butt end, similar to the open end of an optical fiber (Figs. 6 and 7).

B. 21-cm Observations

The reader is referred to [8]–[10], in which the emission profiles of interstellar hydrogen (HI) emitting a spectral line at 21-cm wavelength were recorded using side-lobe corrected neutral hydrogen emission profile data from the Leiden–Dwingeloo All-Sky HI Survey data as well as some observations from the Leiden–Argentina–Bonn All-Sky HI Survey. The salient point of these experiments was the observation of concentric filaments, i.e., SSs, but at a much larger wavelength.

III. Are Planets Located on Dusty Filaments?

Similar MMDC analyses of images of the Earth, Venus, and Saturn, which are taken in visible light by Voyager 1 outside the solar system [11], show that these planets are located on dusty filaments directed perpendicular to the ecliptic plane (Figs. 8–10). The CTS filaments are found to be of nearly identical size, which are directed almost perpendicular to the axis of the filament. The planets are located at butt ends of the tubular blocks lying in the ecliptic plane (Figs. 8 and 9).

The images show that among the blocks composed of filaments, only those that possess a planet at its butt end lies in the ecliptic plane. This observational fact suggests that the solar system planets have a nanodusty origin.

This was first suggested by Alfvén [8] in his theory of the critical ionization velocity (CIV) mechanism as a role in planetary accretion and formation.

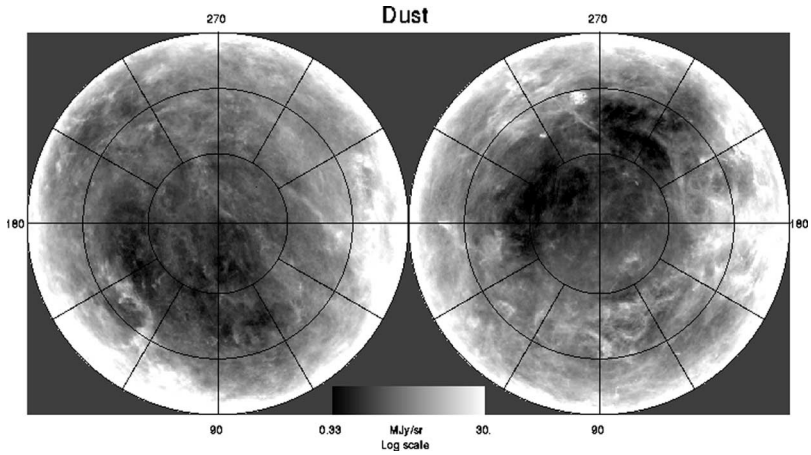


Fig. 1. Image of dust clouds obtained for length of a wave of 100 μm for northern and southern hemispheres of the sky, correspondingly (see [12]).

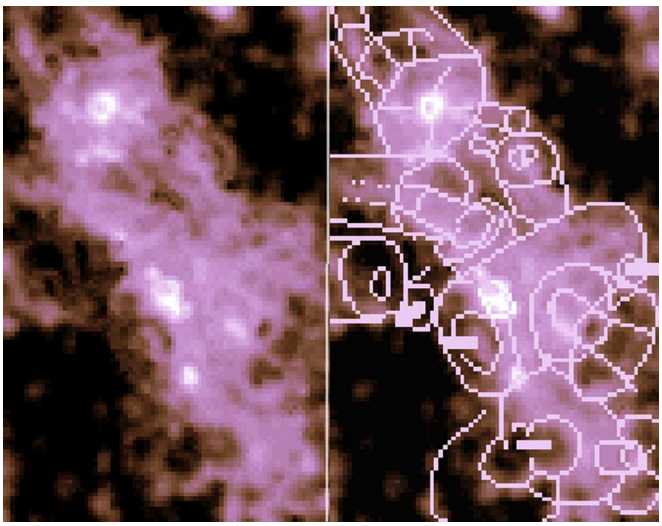


Fig. 2. Fragment of the MMDC-processed image (also, the schematic drawings of the structuring, which are found in the image via more intricate "mosaic MMDC" processing (see fragment in the right) are shown in the bottom pictures; the original images are taken from northern hemisphere of the sky [12]). Here, the CTS may be seen, with CWS in the top butt end of CTS and telescopic nested tubes in the bottom.

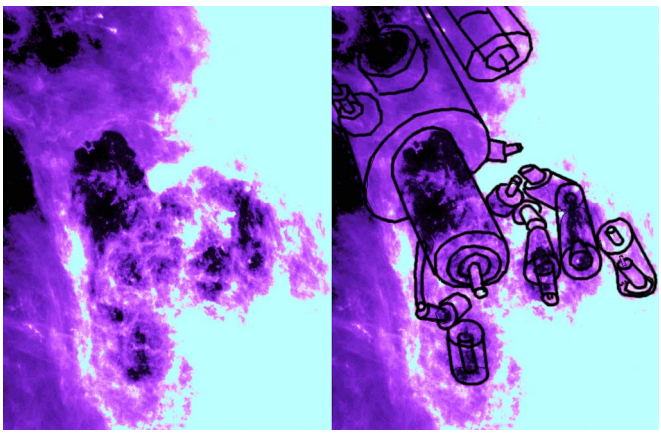


Fig. 3. Fragment of the image from a southern hemisphere of the sky [12], which is processed by means of the MMDC. The CTS with a dark central cylindrical rod is located nearly diagonally in the picture. The butt end of this rod reveals its complex internal structure of telescopic tube type. The amorphous bright mass around the rod has no distinct structure. The smaller dark CTSs, which are connected to the main rod, may be also seen.

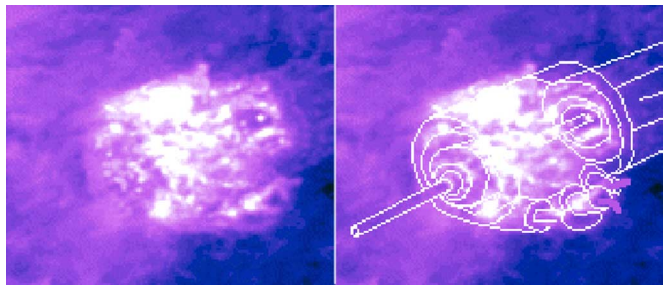


Fig. 4. Fragment of the image from the southern hemisphere of the sky [12], which is processed by means of the MMDC. Multilayered CTSs are directed diagonally. On the right, the joint of the bright block with similar coaxially directed but darker and smaller diameter may be seen.

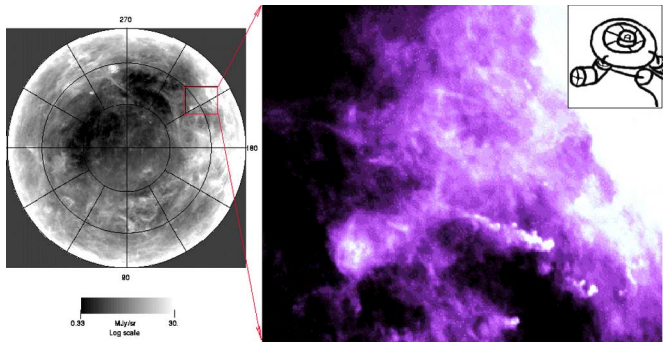


Fig. 5. Left part of this figure marks a fragment of initial image from the project "Dusty-full-sky" (the original image is taken from a southern hemisphere of the sky [12]) which was processed by means of MMDK and given in the right. A schematic drawing is given in the window of the right image. On the bisector of lower corner, the CTS is seen, which is located nearly diagonally and connected with a rim of CWS. Both the CTS and CWS are composed of similar structures of smaller size that indicate on the tendency to self-similarity, i.e., the presence of a fractal. The butt end of the CTS exhibits a sandwichlike structuring. Radial spokes, which serve as connections between the axis and an external shell structure, indicate that the butt end has a CWS. To the right from the center of the picture, a large CWS, which is placed diagonally, may be seen. Its rim is composed of separate CTSs, which are basic blocks of the entire structure. The radial spokes and the axle of this structure seem to be the similar CTS.

It is noted that for the Earth, the filament (and, partly, its fine structure) is observable directly without optical processing. It has been suggested that this is merely an "artifact." However, similar filaments are seen also in the other images taken by Voyager, which is appreciably at larger distances from the

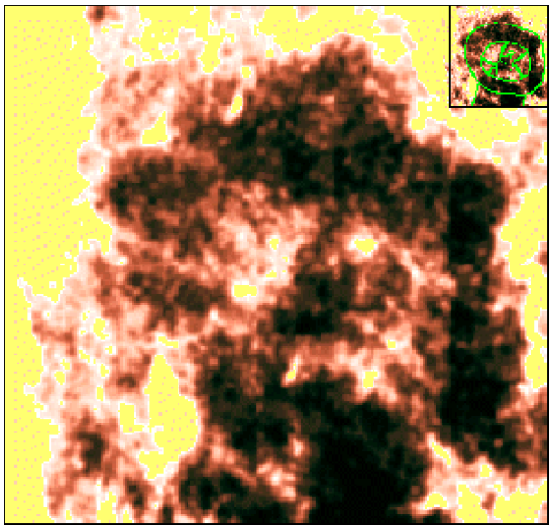


Fig. 6. Fragment of the image from a northern hemisphere of the sky [12], which is processed by means of the MMDC. The CWS on its own axle is seen in this figure. The outer rim, the spokes, and the axle of this structure are composed of CTSs of smaller size.

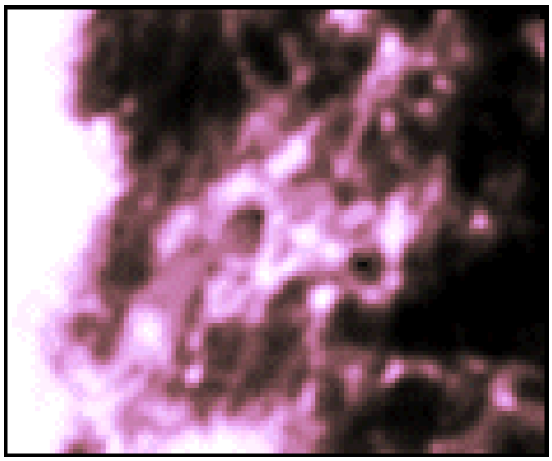


Fig. 7. Fragment of the image from a northern hemisphere of the sky [12], which is processed by means of the MMDC. The complex joints of CTSs are shown, which are uniting them into a common network. Oftentimes, the identical CTSs are linked together by means of stringing on the central cord (as the beads on a thread), taking place through the entire structure.

Sun [13], an unexpected result to those who had proposed the "artifact" explanation.

Ongoing analysis suggests that the numerous satellites of Saturn are also located in the butt ends of similar constituent blocks of the respective filament. In general, this methodology should suggest where one might seek planets and satellites in extraplanetary systems.

IV. Conclusion

The data presented show that the structure of cosmic dust clouds has a skeletal or concentric cylindrical filamental structure similar to the skeletal found in carbonaceous dust particles in the dusty plasma associated with laboratory discharge experiments [6].

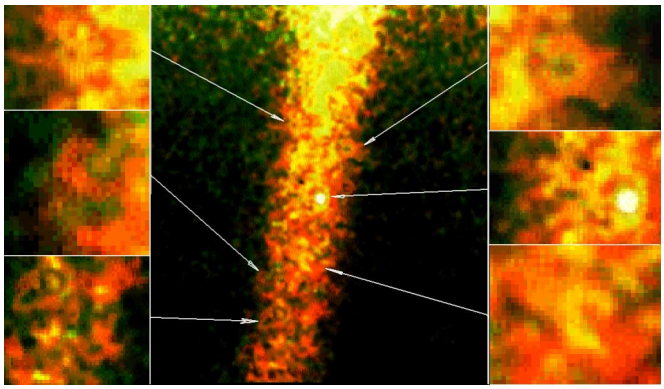


Fig. 8. Here, in the center of the figure, the filament image obtained by the device of the Voyager 1 and processed by means of the MMDC is given. The image of the Earth is a bright white stain on this filament. The image of the given filament has the complex structure; increased elements of which are submitted on each side of the filament image. It is visible that the structure of the given filament represents a design collected of identical coaxially tubular blocks and blocks of type of a cartwheel (a toroidal rim with a radial spokes connections between it and an axis of the cartwheel) on an own axis. The identical cylindrical blocks make up a basis of the given filament, but only the cylindrical block which lays in the ecliptic plane in the butt end has the planet (in a given case, this is the Earth); increased image of which is given on the bottom fragment on the right.

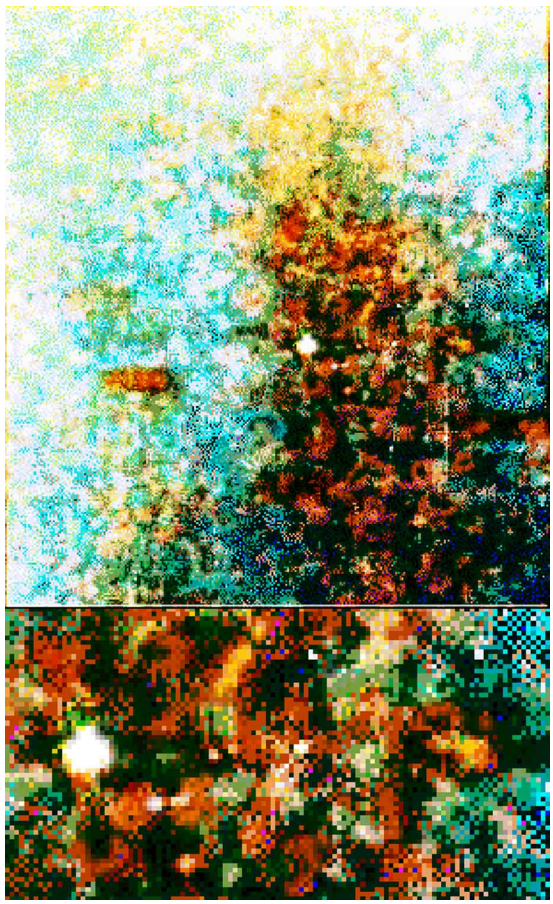


Fig. 9. Fragment of image obtained by Voyager 1 and processed by means of the MMDC. It is seen that the Venus is located in a butt end of a straight cylindrical block with dark lateral surface which is a constituent block of the filament (which is oriented orthogonally with respect to the ecliptic plane) and lies in the ecliptic plane.

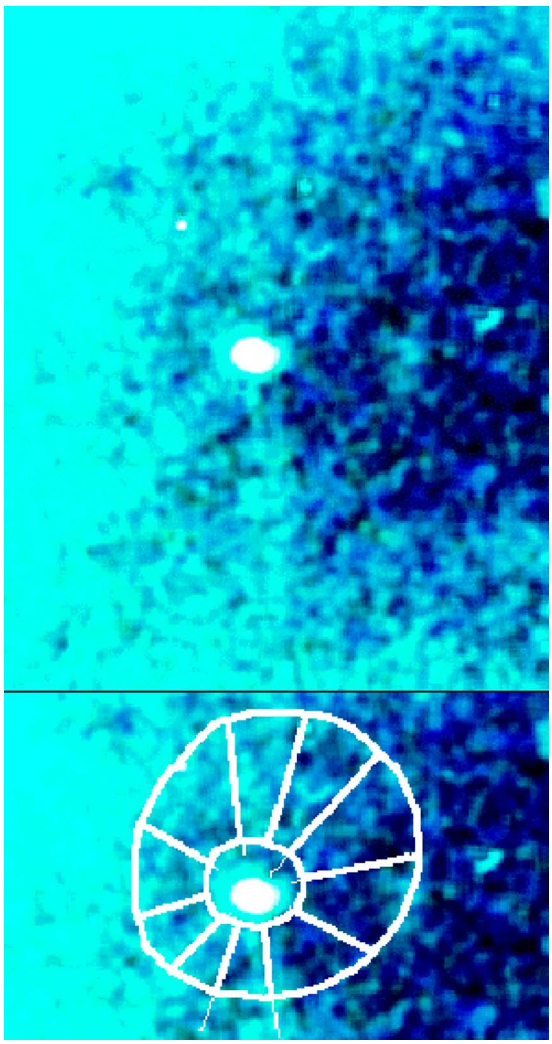


Fig. 10. Fragment of images obtained by Voyager 1 and processed by means of the MMDC is presented here. Saturn is seen as the bright spot in the center of pictures. The schematic drawing of structuring for Saturn's environment is given in the bottom. As against the Earth and Venus, Saturn is in the center of a butt end of a conic coaxial-tubular filament, which also is located in the ecliptic plane and on orthogonal filament with respect to the ecliptic plane. Along an inclination of an axis of a planet, it is possible to determine a corner of an inclination of the ecliptic plane. The joint analysis of the given image with the image of the scheme of a location of the device at exposure of film (see image of [13]) allows the determining position of the Sun concerning a researched planet. This conic block has the complicated filamentary weaving and radial connections.

The consequences of this discovery corroborate both the role of the CIV mechanism in the accretion of solid bodies from dusty plasma as well as the observation of SSs in the interstellar plasma medium.

ACKNOWLEDGMENT

The author would like to thank to A. L. Peratt for the help in stimulating discussion of the data on plasma filaments, V. I. Kogan for the invariable support to skeletal structuring research, and A. B. Kukushkin for the decade-long collaboration in investigations of dusty skeletal structures.

REFERENCES

[1] A. B. Kukushkin and V. A. Rantsev-Kartinov, "Dense Z-Pinch plasma as a dynamical percolating network," *Laser Part. Beams*, vol. 16, no. 3, pp. 445–471, 1998.

[2] A. B. Kukushkin and V. A. Rantsev-Kartinov, "Self similarity of plasma networking in a broad range of length scales: From laboratory to cosmic plasmas," *Rev. Sci. Instrum.*, vol. 70, no. 2, pp. 1387–1391, Feb. 1999.

[3] A. B. Kukushkin and V. A. Rantsev-Kartinov, "Similarity of skeletal objects in the range 10^{-5} cm to 10^{23} cm," *Phys. Lett. A*, vol. 306, no. 2, pp. 175–183, Dec. 2002.

[4] A. B. Kukushkin and V. A. Rantsev-Kartinov, "Skeletal structures in high-current electric discharges and laser-produced plasmas: Observations and hypotheses," in *Advances in Plasma Phys. Research*, vol. 2, F. Gerard, Ed. New York: Nova, 2002, pp. 1–22.

[5] A. B. Kukushkin and V. A. Rantsev-Kartinov, "Filamentation and networking of electric currents in dense Z-pinch plasmas," in *Proc. 17th IAEA Fusion Energy, Yokohama, Japan*. Vienna, Austria: IAEA, 1999, vol. 3, pp. 1131–1134. IAEA-CSP-1/P.

[6] B. N. Kolbasov, A. B. Kukushkin, V. A. Rantsev-Kartinov, and P. V. Pomanov, "Similarity of micro-and macrotubules in tokamak dust and plasma," *Phys. Lett. A*, vol. 269, no. 5/6, pp. 363–367, May 2000.

[7] B. N. Kolbasov, A. B. Kukushkin, V. A. Rantsev-Kartinov, and P. V. Pomanov, "Skeletal dendritic structure of dust microparticles and of their agglomerates in tokamak T-10," *Phys. Lett. A*, vol. 291, no. 6, pp. 447–452, Dec. 2001.

[8] H. Alfvén, *Cosmic Plasma*. Dordrecht, The Netherlands: Reidel, 1981.

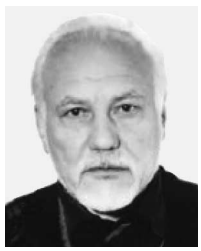
[9] A. L. Peratt and G. L. Verschuur, "Observation of the CIV effect in interstellar clouds: A speculation on the physical mechanism for their existence," *IEEE Trans. Plasma Sci.*, vol. 28, no. 6, pp. 2122–2127, Dec. 2000.

[10] G. L. Verschuur and A. L. Peratt, "Galactic neutral hydrogen emission profile structure," *Astron. J.*, vol. 118, no. 3, pp. 1252–1267, Sep. 1999.

[11] E. V. Bell, Goddard Space Flight Center, Greenbelt, MD. [Online]. Available: http://nssdc.gsfc.nasa.gov/image/planetary/solar_system/solar_family.jpg

[12] D. J. Schlegel, D. P. Finkbeiner, and M. Davis, "Maps of dust infrared emission for use in estimation of reddening and cosmic microwave background radiation foregrounds," *Astrophys. J.*, vol. 500, p. 525, 1998. [Online]. Available: http://www.journals.uchicago.edu/ApJ/journal/issues/ApJ/v500n2/37368/37368.html#fg8; http://www.journals.uchicago.edu/ApJ/journal/issues/ApJ/v500n2/37368/fgl2.gif

[13] E. V. Bell, Goddard Space Flight Center, Greenbelt, MD. [Online]. Available: http://nssdc.gsfc.nasa.gov/image/planetary/solar_system/family_portraits.jpg



Valentin A. Rantsev-Kartinov was born in 1939. He has finished a degree from the Moscow Engineering Physical Institute, Moscow, Russia, specializing on experimental and theoretical physics in 1964, and in 1970, he has finished a postgraduate study in the same institute, where he received the doctoral degree of physical-mathematic sciences.

Since 1970, he has been working as the Physicist–Experimenter in the Nuclear Fusion Institute, Russian Research Centre, "Kurchatov Institute," Moscow, dealing with various thermonuclear installations, and during the last 15 years, he was in the theoretical department. He specializes on diagnostics of plasma. He has more than 100 scientific publications. The area of his scientific interests during the last decade includes the researching of skeletal self-similar (fractal) structure micro and nanodust in a wide range of scales (covering about 35 orders of value, from 10^{-7} cm in nanodust up to 10^{28} cm in cosmos), and the phenomena and environments (laboratory, space, and atmospheric plasma, and also skeletal structures of the ocean).