Yu. P. Ochelkov, V. V. Usov, and A. I. Tsygan. *The Nature of Pulsar Radio Emission.* In the ten years that have passed since the discovery of pulsars, it has been established that:

1) pulsars are rotating neutron stars;

2) the pulse-repetition period (P) of a pulsar's radio emission is equal to the period of rotation of the neutron star;

3) the source of a pulsar's nonthermal emission is energy released on deceleration of the neutron star's rotation: $\dot{E}_{kin}=I\omega\dot{\omega}$, where I is the moment of inertia of the neutron star and $\omega=2\pi/P$;

4) the neutron star is decelerated by "stretching" of magnetic force lines;

5) the radio emission of pulsars is generated in their magnetospheres by an as yet unknown coherent mechanism (for details see Ginzburg and Zheleznyakov[1]).

To construct a theory of pulsar radio emission it is necessary to know the structure and parameters of the pulsar magnetosphere. Although there is as yet no self-consistent solution for the electromagnetic-field configuration and plasma distribution in the magnetospheres of pulsars, the following statements can now be made with some confidence:

1) the magnetic field H at the surface of a pulsar is $\sim 10^{12}-10^{13}$ G;

2) the surfaces of most pulsars (except perhaps for "young" objects such as NP 0532 and PSR 0833) are solid;

3) the electric field strength near the surface of a pulsar ranges up to $\sim(0.1-1)\times(\omega R/c)H$, where $R\approx 10^6$ cm is the radius of the neutron star;

4) the magnetospheric plasma consists of ultrarelativistic electrons and nuclei pulled by the electric field from the surface of the neutron star and of secondary relativistic electron-positron pairs generated from hard gamma quanta;

5) the plasma in the near zone of the magnetosphere moves along curved magnetic field force lines.

The literature discusses about twenty specific maser and antenna mechanisms that could be responsible for generation of pulsar radio emission. Attempts to explain pulsar radio emission in terms of coherent radiation of charged plasmoids moving along curved magnetic force lines have recently been appearing with increasing frequency. The sole basis for this is that the parameters of the pulsar radio emission can be calculated more simply in this model than in others (there are as yet no profound physical causes that would designate this mechanism). Knowing the nature of the emission from a single plasmoid,[2] we can calculate the radio emission of a system of moving plasmoids for various magnetic-field geometries outside of the pulsar. The paper shows how the intensity and spectrum of pulsar radio emission can be explained with an appropriate choice of plasmoid parameters. However, it remains unclear how the plasmoids are formed in the pulsar's magnetosphere. For example, Benford and Buschauer[3] observe that although the electron-positron plasma in the pulsar magnetosphere is unstable, there is insufficient time for significant development of this instability during the escape of the plasma from the light cylinder.

The uncertainty in the theory of pulsar radio emission is reflected by the continuing proposal of new models to account for it. One of these models,[4] which differs radically from the earlier ones, was discussed in the paper presented. In this model, the cooled neutron star shows up as a radiopulsar only when it is surrounded by a rather dense neutral gas. Accreting on the neutron star, this gas is ionized at a distance of $\sim 10^2$ star radii, forming a plasma layer. The charges of this plasma may be separated in the electric field of the star, with formation of bunches of charged particles. Moving toward the star's surface along the curved magnetic force lines, these bunches emit radiofrequency electromagnetic waves in the direction of their motion. The radio emission is then reflected from the surface of the neutron star and escapes into space in a relatively narrow solid angle. This model offers an unforced explanation of the fact that the distances between pulsars and the plane of the Galaxy do not depend on their age.

[1]V. L. Ginzburg, V. V. Zheleznyakov, Ann. Rev. Astron. and Astrophys. **13**, 511 (1975).
[2]A. Siggion, Astron. and Astrophys. **44**, 285 (1975).
[3]G. Benford and R. Buschauer, Mon. Not. RAS **179**, 189 (1977).
[4]A. I. Tsygan, FTI Akad. Nauk SSSR Preprint No. 547, Leningrad, 1977.

L. M. Ozernoĭ and V. V. Usov. *The Origin of the High-Frequency (Optical, X-Ray, and Gamma-) Radiation of Pulsars.* For some time, the pulsar NP 0532 in the Crab Nebula was the only one from which high-frequency pulsating emission (infrared, optical, x-ray, and gamma) was registered in addition to the radio emission. Subsequently, gamma radiation from the pulsar PSR 0833-45 in Vela was also observed; a diligent search for optical radiation from it has also recently met with success.[1] The possibility of generation of high-frequency emission was linked to the youth of the pulsar, and the absence of optical and x-ray emission, not to mention γ-radiation, from middle-aged and "elderly" pulsars appeared quite natural. Thus the 1976 discovery[2] of pulsating γ-emission from two totally undistinguished radio pulsars, PSR 1747-46