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TYPICAL MOTIONS IN MULTIPLE SYSTEMS

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In very old times, people counted - one, two, many. I want to show you now that they were right.

Let's consider the motions of isolated bodies:

1. $N = 1$ - simple motion;
2. $N = 2$ - Keplerian orbits;
3. $N = 3$ - this is the difficult problem. In general, this problem can be studied only by computer simulations.

We studied this problem over many years (see, e.g., Agekian and Anosova, 1967; Anosova, 1986, 1989a,b). Our principal result is: two basic types of dynamics take place in triple systems. The first special type - the stable hierarchical systems with two almost Keplerian orbits. The second general type - the unstable triple systems with complicated motions of the bodies. By random choice of the initial conditions, by the Monte-Carlo method, the stable systems comprised about ~10% of the examined cases, the unstable systems comprised the other ~90% of cases under consideration.

4. $N > 3$ - the studies of dynamics of such systems by computer simulations show that we have in general also the motions roughly as at the cases 1 - 3 with the relative negative or positive energies of the bodies.

Our moving picture shows the typical trajectories of the bodies in unstable triple systems of the general type of dynamics. Such systems are disrupted always after close triple approaches of the bodies. These approaches play a like role the gravitational slingshot. Often, the velocities of escapers are very large. On the other hand, our movie shows also the dynamical processes of a formation, dynamical evolution and disruption of the temporary wide binaries in triples and a formation of final hard massive binaries in the final evolution of triples.

The movie "Dynamical evolution of triple systems" was shown.

At end, I want to say that the various intensive studies in the field of extragalactic astronomy carried out at the Leningrad University of Astronomical Observatory during many years. Now, we thank very much the Scientific Organizing Committee of the Colloquium No. 124 of the IAU and in special Dr. J. Sulentic on this beautiful possibility to participate at this very interesting meeting.

REFERENCES

Agekian, T. A., and Anosova, J. P. 1967, Sov. Astron. Journ., **44**,
6, p. 1261-1273.

Anosova, J. P. 1986, Astrophysics and Space Science, **124**, 2, p.
217-241.

Anosova, J. P. 1989a, Comments on Astrophysics, **1414**, 1, p. 17-
36.

Anosova, J. P. 1989b, Comments on Astrophysics, **14**, 1, p. 37-60.

DISCUSSION

Mamon: Are all your particles point masses or have you tried extended masses? Do you find that in the case of extended objects you have fewer particles escaping?

Anosova: We have in some instances used extended mass distributions such as $m \propto r$. The answer to your second question is yes. The qualitative evolution of such systems is conserved, but the velocities of the escaping particles are less (decreases) as the very close triple approaches of the bodies take hot place.