by Lingham-Soliar *et al.*:

> 'The pervasiveness of the beguiling, yet poorly supported, proposal of protofeathers in *Sinosauropteryx* has been counterproductive to the important question of the origin of birds.'

Lingham-Soliar *et al.* are more right than they would probably care to admit. Despite the fatal blows their latest paper inflicts on a widely-held evolutionary idea, they're not about to question the evolutionary paradigm itself.[8] This shows once more that although evolutionists continue to demolish one another's hypotheses, they fail to come to terms with the underlying problem of their fossil investigations—the materialist worldview. Once again, these well preserved fossils prove to be wonderfully consistent with rapid burial in the global Flood.

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Migrating planets and migrating theories

Wayne Spencer

For many years the accepted theory of planet formation has been the 'Nebular Hypothesis'.[1] This holds that all the planets in our solar system formed—in the regions where they are now located—from a disk of gas and dust. In recent years, astronomers have entertained, among other ideas, the possibility that some planets in our solar system formed nearer to the sun and then 'migrated' outward to their current orbital positions in the first few million years after the planets formed. After years of study of extrasolar planets, a variety of scenarios have been considered for how Uranus and Neptune formed. The near circular orbits of Jupiter, Saturn, Uranus and Neptune, as well as their relatively large distances from the sun, make them rather unusual compared to other planetary systems around other stars. Long accepted naturalistic origins models for our solar system did not work for extrasolar planetary systems, and models for extrasolar planetary systems did not work for our solar system. This led planetary scientists to modify existing theories for our solar system. The Nebula hypothesis always had scientific problems and still does, but today there are new attempts to refine origins models so that planet formation theories are capable of explaining both our solar system and other planetary systems.[2]

There are valid principles of physics at work in the planet origins models but these models are limited by the assumptions built into them. In a protosolar nebula, where there are planetary bodies forming and there is gas and solid objects in the disk surrounding the sun, gas drag tends to cause solid objects to spiral into the sun. This is true for both small solids and planet-sized bodies.

Naturalistic origins models have examined theoretically by computer simulations what happens to the protosolar disk and planetary bodies embedded in the disk. How planetary bodies migrate (such as inward or outward) in such a disk depends on the characteristics of the disk such as its size, density, the size of the objects in it and density of gases in it. A very large disk would more likely make planets migrate outward for instance, depending on the planet's orbits. The disk must have enough material in it long enough to allow the planets to form. The disk provides the source of gas and solid objects that accrete onto the forming planets.

In our solar system, Jupiter and Saturn are located at distances from the sun that seem to fit accepted models that say they formed where they are by accreting gas and matter from the disk. But for Uranus and Neptune the same process is problematic because of their greater distance from the sun. Uranus and Neptune are farther from the sun than many observed extrasolar planets. At the greater distance from the sun than Jupiter or Saturn, Uranus and Neptune would accrete matter at a slower rate and the disk would likely dissipate before these two planets could become as large as we find them today. Thus scientists now consider it possible Uranus and Neptune originally formed nearer to the sun and migrated outward to their present positions.

Other solar systems

In the past 10 years astronomers have found evidence of planets orbiting other stars.[3] These 'extrasolar' planets are often detected by measuring the 'wobble' of their star. Some have been detected by other methods, such as studying the changes in the star's light as the planet passes in front of the star.

Exoplanets, as they are sometimes called, have raised difficult questions for scientists trying to explain their origin.[43] These extrasolar stellar systems sometimes have planets similar to the giant planets of our solar system. However, many exoplanets are located very near their star and they often follow very elongated elliptical orbits.

Image by NASA/JPL

Artist's conception of a fledgling solar system.

Evolutionary planetary scientists have had difficulty explaining how a spinning disk can form planets very close to a star. Rather, they believe gas giants could form only if it was cool enough for ice to condense, so that the planet could accumulate enough mass to suck gas in from the cloud (the ice also helps the rock to stick).[3] So, to explain extrasolar planets, the physics generally demands that planets would form at some distance from the star and then move inward.

Death spiral

But this theory leads to a problem that has been called the 'death spiral'.[5] If the disk can make the planets move inward close to the star, what will prevent the planets from falling into the star? In some models, planets would migrate inward until they reach the inner edge of the disk. Or, other models propose that the forming planets would open up gaps in the disk. It is suggested that our sun may have cleared out gas from the inner solar system (within about 5 AU from the sun) early in its history from magnetic effects. This would prevent planets from migrating too close to the sun. Recent computer simulations showed what happens when several planets were migrating inward toward their star—it is probable that the planets would eventually collide with the star unless there is some special characteristics of the disk that prevent it. Multiple planets would tend to 'all go down together' due to their mutual gravitational pulls on each other.[1,6]

Evolutionary stories

We can thank the Creator that our own solar system is more stable than this. The problem of the planets spiraling into the star is a serious one for scientists who do not allow for the possibility of a Creator God. Some scientists now propose that perhaps some planets do fall into the star but then there are other planets that form. They suggest there could be multiple generations of planets and only some of the planets remain in stable orbits for long periods of time. The difficulty with multiple generations of planets is that the disk of dust and gas that provides the raw material for planet formation cannot last long enough. In 'only' a few million years the disk would dissipate and become too thin for planets to form—a big problem for billions-of-years belief.[7]

A new model of our solar system is generating some excitement. It is called the Nice model, after the city of Nice, France, where the scientists met to develop the theory in 2004.[5,8] It addresses how the orbits of the outer planets in our solar system could have changed over millions of years to become as we measure them today. Though the four giant planets have nearly circular orbits, their inclinations and eccentricities have been a difficulty for the Nebula Hypothesis.

The Nice model proposes that Uranus and Neptune originally formed much closer to our sun than where they currently reside. Also, at one time Jupiter and Saturn supposedly had different orbits that nudged Uranus and Neptune just right to cause them to migrate outward from the sun. The model also proposes that matter left over after planet formation would cause the newly formed planets' orbits to change. The enthusiasm for the Nice model is because it purports to explain not only why the planets are in their present orbits, but also some of the small objects in the solar system and why there would have been an intense bombardment of impacts after the planets formed. If the large gas planets in our solar system were migrating outward, this would cause collisions and drastically affect the asteroids as well as objects in the Kuiper region, beyond Neptune's orbit. The Nice model does seem to give some very results very close to the observed characteristics of the orbits of the four giant planets. Researchers state that it predicts 'all the important characteristics of the giant planets' orbits, namely their final semimajor axes, eccentricities and mutual inclinations.'[7]

Computer simulations and assumptions

Models such as this are simulated in computer programs. These simulations only work when the investigators assume certain special arrangements. For example, the disk used in the model had its inner edge at 5 AU and its outer edge at about 30 AU in diameter (one AU is the mean distance of Earth from

the sun, 150 million km (93 million miles)). These dimensions of the disk are 'just right' to make Uranus and Neptune migrate to about where we see them today. If the disk were larger in its outer diameter, Uranus and Neptune would move too far out. Some astronomers have objected to the Nice model on the grounds that real observed disks around stars are normally much larger, such as 100 or even 300 AU in diameter. The properties of the disk used in the Nice model make it particularly massive and yet small and 'compact' which makes the disk more able to cause migration.

These objects beyond Saturn would have to cause small changes in the orbits of Jupiter and Saturn. If Jupiter and Saturn were not nudged just right, Uranus and Neptune would not end up in an orbit as we see today.[9] The researchers describe the interaction of the planets in their model: 'As a result of the "compactness" of the system, the planetary orbits become chaotic and intersect.'[7] In computer simulations of this kind many runs are done with varying initial conditions. The researchers found initial arrangements of the initial positions of the planet orbits that were more likely to give a successful set of final results. In their best runs, the four giant planet orbital parameters gave good results in about 50% of cases. The chaotic nature of the dynamics means that many different results are possible because of the sensitivity to the initial conditions. In some cases (33% of runs) Uranus or Neptune were actually ejected from the solar system because of Saturn. One item to note is that their simulations did not account for the self gravity of the objects in the disk. It is not clear what effect that would have, but because of the relative density of their disk it perhaps should be included in the simulation. Another potential issue with the model, is that some moons would not survive the planetary close encounters.[7] In the Nice model, the key to its explanation of the outer planet orbits is the close orbital encounters between the planets, either Uranus and Neptune interacting or one of them interacting with Saturn.

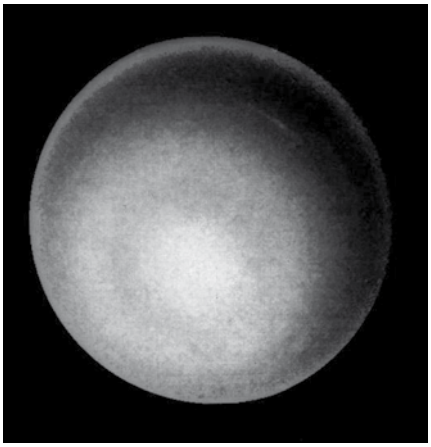

Image by NASA/JPL

Uranus has been hard to explain in planetary migration models.

Conclusion

From a Christian perspective, God made the special arrangements of the planets to suit His purposes, so that our solar system would be a stable neighborhood for us to reside in. Our solar system is not just a 'lucky run' as in a computer simulation, but was planned and created for God's purposes. It is important to bear in mind that the solar system has undergone significant changes since creation due to impacts and other processes. Some objects in our solar system may have had their origin from catastrophic collisions or near collisions. The Creator may have created the heavenly bodies in such a way as to defy naturalistic explanations.[10] But successful simulations do not rule out supernatural creation. In fact, the simulations actually demonstrate the very concept of intelligent design. The investigators found initial conditions and processes that gave a successful result for the planet orbits. If an intelligent scientist can produce the proper planet orbits from a simulation, why should we not believe that an intelligent creator, who is all powerful, could also produce the orbits in reality? Both the Creator and the scientists doing the Nice simulations had the end result in view in their work. But since the Bible implies a young age for our solar system and the earth, Christians should not accept naturalistic origins scenarios that conflict with the biblical time scale. The biblical picture of supernatural creation in a young universe is the best explanation of the origin of planets.

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