Solar system formation by accretion has no observational evidence

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For over 200 years there has been the belief that the sun, planets and moons originated from a vast cloud of gas and dust, the *primordial nebula or solar nebula* (Lat. *nebula = cloud*). Celestial bodies allegedly formed when gas and dust particles coalesced in a process called *accretion*, forming *protoplanets* or *planetesimals*. Accretion theory is part of the *nebular hypothesis* of solar system formation. Experiments have not demonstrated that accretion occurs. God created heavenly bodies by His *spoken* word (Ps. 33:6), not a process—rapid or not—conforming to post-creation scientific laws. Experimental challenges to accretion theory are presented, followed by discussion of the lack of astronomical observations for it.

Lab experiments: no accretion

Case #1. Nickel-iron alloy condensate grains were grown to submicron size at 10^{-4} atmospheres, taken as the pressure in the *pre-solar nebula*, in an enclosed environment without turbulence.[1] What do these conditions have to do with actual accretion? The author's conclusion was *not much*: "the direct growth from the gas of large grains or droplets is very difficult, under any conditions familiar to us."[2] Hope was nevertheless held out that accretion could occur under hypothetical conditions not yet known:

> "Undoubtedly there are astrophysical situations, as there are terrestrial ones, where these special conditions are and large masses can grow directly by condensation from the vapor. It is hardly imaginable, however, that they could extend widely through the solar system."[2]

Donn and Sears proposed a number of *ad hoc assumptions* to make accretion appear plausible, such as hypothetical crystal growth at alleged 'screw dislocations' caused by putative radiation damage under less-than-normal supersaturation regimes.[3] But even the assumed supersaturation in the primordial nebula was *ad hoc*, since this would require a prior high material concentration, which is what the theory sought to produce in the first place.

Case #2. Planetary scientist William K. Hartmann noted that,

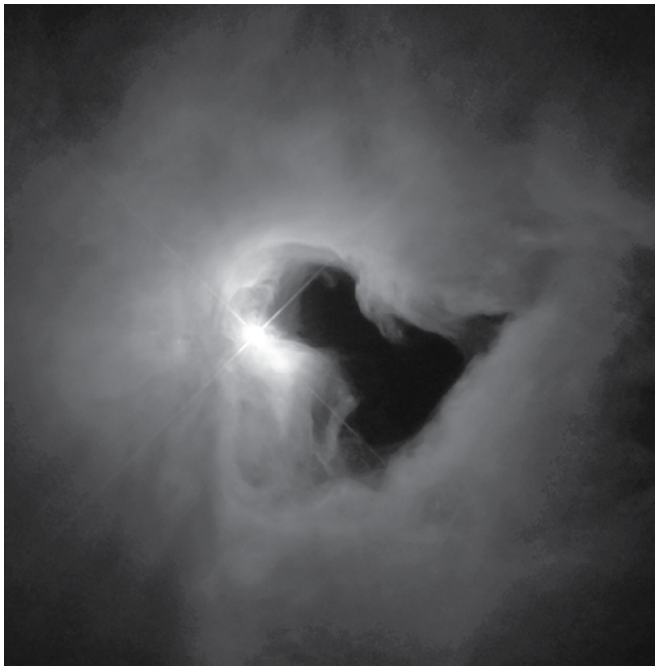
> "Ordinary evidence suggests that if neighboring, sun-orbiting rock particles hit at low speeds, they would simply bounce apart without sticking; if they hit at high speeds, they would shatter each other instead of combining. ... Kerridge and Vedder (1972, pp. 161–162) designed an experiment with silicate particles hitting each other at speeds of 1.5 to 9.5 km/s (typical of collisions in today's asteroid belt) to test whether any sticking or impact welding occurred. They found none; the particles shattered."[4]

To avoid shattering during collisions, Kerridge and Vedder proposed much lower hypothetical approach velocities.[5] The velocity became an *adjustable parameter* which might hypothetically allow accretion to occur. Greenberg and colleagues ran computer simulations at the lower velocities and concluded that with these hypothetical conditions, accretion was possible.[6] But this type of 'confirmation' is an example of *ad hoc assumption formulation* in which the lower velocities required by accretion theory were assumed to justify the theory. *This is reasoning in a circle*.

Case #3. Comet expert Fred Whipple[7] described laboratory tests of Mayo Greenberg (1922–2001) at the Leiden Observatory in the Netherlands attempting to simulate formation and growth of interstellar dust grains in *molecular clouds*.[8,9] He exposed the types of gases in such a cloud at about 20K (-253°C) to ultraviolet radiation of an intensity thought to be similar to typical dim starlight. However, no coalescence of gas molecules occurred without imposing two artificial conditions: (1) use of a 'cold finger' (a surface super-cooled to cryogenic temperatures) as a *nucleation* site to initiate coalescence; and (2) use of gas concentrations higher than could actually exist in a molecular cloud. The second condition was especially important, because molecular clouds have too low a gas concentration to allow spontaneous nucleation even at a temperature as low as 20K. Thus Greenberg's 'simulation' of dust grain formation was not really a simulation at all. Two special conditions which would not be true in nature were imposed by the 'human intelligence' conducting the experiment. Blum likewise emphasized that accretion conditions are *assumed*, and are not *known*, to have existed:

> "The theoretical considerations and their predictions for the development of the solid bodies in the early solar system strongly depend on a couple of assumptions, the validity of which can only be proven experimentally. Among the processes to be determined empirically [are] the low velocity collision behavior of single dust grains and aggregates including simulation experiments on the long-term dust aggregation [sticking] …"[10]

But according to Blum, these required conditions—*low velocity* and *aggregation*—have not yet been observed in lab settings. Similarly, Armitage concluded: "For pairwise



A Bok globule in the reflection nebula NGC 1999 in Orion; star left of center is V380 Orionis, 3.5 times solar mass, and is responsible for the light which the nebula reflects (NASA-HST). In the accretion theory, the nebula is supposed to be material collapsing into the star.

collisions to work fast enough, meter sized objects need to efficiently stick together upon collision rather than breaking up. This has not been demonstrated in laboratory experiments."[11] Thus experiments have failed to show that mere *collision* of particles can make them stick and grow into larger bodies *under conditions believed to exist in the early solar system.* Have theorists therefore considered accretion theory to be falsified? The answer is *No*. Instead, the concept of *gravitational instabilities* was introduced to explain how colliding particles might be forced to adhere despite their natural tendency not to. Goldreich and Ward claimed, "[S]izable planetesimals can accrete directly from dust grains by … gravitational instabilities." They continued, "Thus, the fate of planetary accretion no longer appears to hinge on the stickiness of the surfaces of dust particles."[12] So the obstacle of colliding particles not sticking was overcome. *Or was it?* In a staggering admission, Goldreich and Ward concluded:

> "Although we have dismissed the sticking of dust grains as unnecessary to the planetary accretion process, there is a more fundamental reason for disregarding it altogether. That is, even if the dust grains tended to stick together upon impact, the growth of solid bodies by this process would be much slower than by the gravitational instabilities we have described."[12]

In other words, even if colliding particles could stick, the resulting growth into planetesimals would be *extremely* slow, requiring *longer* than the millions of years allotted for it. Slusher estimated 30 Ga as the time for a single interstellar grain to form by collisions—of the order of *ten times* the age of the solar nebula.[13] Harwit estimated 3 Ga needed for a grain to grow to 10^{-5} cm.[14] Thus more recent accretion theories have relied on factors other than simple collision for planetary formation.

Another factor suggested to cause particle accretion was the *bistability phenomenon* (BP), in which a nebula could exist in certain chemical states promoting dust grain growth. But Shalabiea and Greenberg concluded that "the assumptions *required* for the existence of the BP are inconsistent with fundamental astrophysical observations of atomic abundances. … It appears highly unlikely and probably impossible that bistability plays any role in interstellar chemistry."[15]

Other theoretical innovations also have so far not explained how accretion could have happened. Dorch lamented,

> "[C]urrent scenarios and theories fail to provide satisfactory explanations for many aspects of planet formation. The situation appears to often be characterized by comparisons of two (or more) scenarios, where the inadequacies of one is taken as evidence (or even 'proof') in favor of another, while the possibility that none of them is correct is not considered seriously enough. … [A] variant of this approach is to argue that 'since we are here—terrestrial, gas and ice planets and all, one of the considered scenarios must have worked, and since I can show it wasn't scenario A, it must have been B!'"[16]

With lack of experimental confirmation of accretion spanning several decades, what are we to make of confident descriptions of accretion such as the following?

> "Small particles easily stick when they collide and form aggregates with an open, often fractal structure, depending on the growth process. Larger particles are still expected to grow at collision velocities of about 1 m/s. Experiments also show that, after an intermezzo of destructive velocities, high collision velocities above 10 m/s on porous materials again lead to net growth of the target."[17]

But the 'experiments' alluded to were *computer simulations* in which the necessary collision velocities were *assumed* in order to ensure accretion, as in older studies. Even so, confidence was expressed that the computer simulations correctly implied particle growth: "Considerations of dust-gas interactions show that collision velocities for particles not too different in surface-to-mass ratio remain limited up to sizes about 1 m, and growth seems to be guaranteed to reach these sizes quickly and easily."[17] Again there was the assertion of particle growth, *but only up to 1 meter*.

Beyond the 1-meter particle size, problems develop which not even *theoretical* models have solved: "For meter sizes, coupling to nebula turbulence makes destructive processes more likely. Global aggregation models show that in a turbulent nebula, small particles are swept up too fast to

be consistent with observations of disks."[17] Even computer modeling *designed* to demonstrate accretion shows that particles 1 meter and larger are more likely to be destroyed than grow. Dominik *et al.* therefore supposed that, "An extended phase may therefore exist in the nebula during which the small particle component is kept alive through collisions driven by turbulence which frustrates growth to planetesimals until conditions are more favorable for one or more reasons."[17] This 'extended phase' has been detected neither empirically nor in theoretical modeling. Neither support the belief that accretion could occur.

Yet dust and debris fill expanses of the solar system, Milky Way galaxy, and universe. In the Milky Way, this debris is the *interstellar medium* (ISM); between galaxies, it is the *intergalactic medium* (IGM). If these dust particles did not form by accretion, what is their origin? Theorists, in line with accretion theory, once believed that *primordial dust formation* made the ISM and IGM.[18,19] When Big Bang theory was proposed in the 1940s, theorists assumed that virtually all elements formed initially as big bang products, not in stars.[20] Then these primordial atoms must have accreted into dust grains, the ISM/IGM. Thus the ISM/IGM was a *primordial product*. Indeed, Cernuschi wrote that, "To explain the origin of the cosmic grains, we suggest that they were formed in the early stages of the expansion of the universe".[21] Van de Hulst concluded, "It is not hard to picture how dust grains might grow in space."[22]

But the big bang could not account for most isotopes, so stars were invoked as the source.[23,24] Failure of the big bang to account for all but the lightest elements (in fact it cannot account even for these[25]), coupled with the failure of accretion to form dust grains, means that the ISM/IGM cannot be leftover debris from the primordial cosmos. Nowadays the ISM/IGM is viewed as a stellar instability product. The shift of the ISM/IGM from an *accretion product* to a *stellar instability* product challenged accretion theory. Yet despite removal of the ISM/IGM as evidence for accretion, the accretion theory and its larger framework, the nebular hypothesis, are still advocated.

Nebular hypothesis: no supporting data

French mathematician Pierre Simon Laplace (1749–1827) proposed the nebular hypothesis in his *Exposition of the System of the World*[26] as an *unproved idea* offered "with that distrust which every thing ought to inspire which is not the result of observation or calculation".[27] Even so, the nebular hypothesis was 'generally accepted' by the early 1800s.[28] But in the mid-1800s it fell on hard times because physicist James Clerk Maxwell (1831–1879) discredited it. Maxwell's critique was so devastating that the nebular hypothesis was largely abandoned for almost a century, till the 1940s. During this time, evolutionists proposed other solar system origins theories, all eventually discarded.[29] The nebular hypothesis was finally advocated again because the other theories had failed.

Maxwell discredited the nebular hypothesis by considering the processes forming Saturn's rings; "he showed that the tendency toward conglomeration into a single satellite, suggested by the nebular hypothesis, would be effectively counteracted by the dynamical factors involved in the revolution of the particles around the central massive body."[30] Thus the debris in Saturn's rings could never coalesce into a single moon, because the forces of dissolution outranked the forces of attraction. What was true of Saturn's rings would also be true for the solar system. The sun, planets and moons could never have formed from coalescing gas and dust because the forces of dissolution are too strong. Maxwell knew that he had demolished the credibility of the nebular hypothesis[31]; describing Saturn's rings, he wrote:

> "We have now to take account of variations in the form and arrangement of the parts of the ring, as well as its motion as a whole, and we have as yet no security that these variations may not accumulate till the ring entirely loses its original form, and collapses into one or more satellites, circulating around Saturn. In fact such a result is one of the leading doctrines of the 'nebular theory' of the formation of planetary systems ..."[32]

The fact that Saturn's rings could not coalesce to form new moons was significant, because Laplace had used Saturn's rings to illustrate the nebular hypothesis ("Laplace ... incorporated the rings in his suggestive theory of the origin of the solar system"[33]).

After almost a century of futile search for a nebular hypothesis replacement, German physicist von Weiszacher (1912–2007) adjusted equations for the nebular hypothesis to make it produce a solar system arranged according to Bode's law.[34,35] But extrasolar planetary systems do not follow Bode's law (nor does Neptune in our solar system), and the nebular hypothesis has not explained them, a point discussed below. From the 1940s onward, Von Weiszacher's efforts were generally accepted as making the nebular hypothesis scientifically acceptable. But was this really the case? The answer is *No*, because as we will see, observational evidence for it is lacking. And as with accretion theory, the nebular hypothesis has become more complex with time because the simpler failed. The nebular hypothesis now includes (1) an accretion stage; (2) a planetesimal formation stage; (3) a planetary core (*planetary embryos*) stage; and (4) a *planetary migration* stage.[36] The planetary migration stage is necessary because, according to theory, once planetary cores have formed, they are in the *wrong places* to resemble a planetary system, so must be made to 'migrate' to their proper location. We have seen that observational evidence for the accretion stage is absent, but so are data confirming the other stages.

No evidence for the solar nebula

If the solar system originated from the solar nebula, it might be expected that "debris left over from the formation of the solar system … is continuously falling toward the sun

and vaporizing",[37] producing an easily detectable infrared glow as it burns. Measurements during the eclipse of 11 July 1991, showed no such glow,[37,38] and previous detections of circumsolar dust were attributed to sun-grazing comets. Thus, dust from the nebula was absent, suggesting that there had been no nebula. On the other hand, observations of *debris formation* are common in astronomy, especially in cases of *stellar instability* discussed below. The cosmos seems to be undergoing dissolution rather than evolving. This is why theorists have been unable to explain how the solar nebula—*even if it had existed*—could collapse into celestial bodies. At the end of a long review of nebula collapse theories (also known as *cloud formation theories*), one theorist could say only that "there is no complete theory of cloud formation yet".[39] Jeffreys once lamented, "To sum up, I think that all suggested accounts of the origin of the Solar System are subject to serious objections. The conclusion in the present state of the subject would be that the system cannot exist."[40]

Has this assessment changed? The answer is *No*. News reports of current space missions hold out hope that forthcoming data will *finally* lead to an understanding of solar system origins. For instance, the European Space Agency's Global Astrometric (GAIA) satellite, scheduled for launch in 2011, "should enable astronomers to reconstruct the conditions under which a shapeless cloud of gas and dust gave rise to our solar system."[41] Similarly, there is the hope that, "Close-up studies of asteroids and burned-out comets may reveal clues about the early universe."[42] A report about the Cassini mission to Saturn's rings said, "Scientists hope the mission will provide important clues about how the planets formed."[43] But if the nebular hypothesis has accounted for the solar system's origin, *why is hope held out that finally its past will be understood?*

No evidence of nebula collapse

If the nebular hypothesis were true, astronomers should observe clouds of debris elsewhere in the galaxy collapsing, as the solar nebula did. Each of these *giant molecular clouds* is supposed to be like the solar nebula was billions of years ago, before it collapsed. A giant molecular cloud is a nebula (plural *nebulae*), or is considered part of a larger nebula. Like the solar nebula is supposed to have been, giant molecular clouds (GMCs) are many times larger than the solar system, typically *hundreds* of light-years across. A beam of light would take centuries to cross a typical GMC, but crosses the solar system in only hours. The solar nebula is supposed to have produced only *one* solar system, but theorists speculate GMCs have enough gas to produce many suns and planetary systems. Despite this theorizing, "No astronomer has ever observed the process of cloud collapse,"[44] and "no one has caught a molecular cloud in the act of collapsing."[45] For clumps in clouds that have been observed, Blitz says, "*None* of the clumps in the clouds ... observed are gravitationally bound [collapsing]. ... Because the clumps are so far from being gravitationally bound ... the clumps must be expanding."[46] For Blitz, "This conclusion is difficult to accept."[46] So GMCs exist, but their *non-collapse* says that the solar system could not have formed from nebular collapse.

No evidence of stars forming

If the nebular hypothesis were true, astronomers should see stars forming from debris contracting inward, as the sun supposedly did. But "no one has unambiguously observed material falling onto an embryonic star, which should be happening if the star is truly still forming."[45] Accordingly, theorists have concluded that, "Giant molecular clouds are not collapsing dynamically and have, in fact, generally a very low efficiency for stellar genesis."[47] Thus, GMCs cannot be expected to collapse into stars, despite the widespread belief that they are. Gravitational collapse cannot happen in a diffuse, rarified gas cloud to form a star; it is not dense enough. "The only way for a … cool interstellar cloud to contract from nebular to stellar dimensions is to be dense enough so that the gravitational attraction of its particles for each other is strong enough to start it contracting".[48] Thus theorists recognize that a GMC cannot begin collapsing on its own. There must be an *external force* to bring the GMC to a density high enough to trigger collapse.

Nebular theory must suppose that another physical body provides this force, such as *other clouds already in collapse* or *unstable stars* sending shock waves (density waves) into the surrounding space. Thus the theory presumes the pre-existence of a successfully-collapsing cloud or an already-formed star, which is what the theory seeks to explain in the first place. As theorists have said, "Star formation can also be induced [or] triggered by a mechanism external to the clump. ... Shocks, which can be due to supernovae [unstable stars] or to cloud-cloud collisions, have been invoked frequently as a mechanism for inducing star formation."[49] In other words, "The general model requires some mechanism to trigger a cloud's collapse: a supernova explosion, a shock wave from the galaxy's spiral arms, cloud collisions, or stellar winds. Why clouds don't collapse on their own ... is still a 'great mystery'."[50] Another theorist wrote, "Since the 1960s, in numerical models of protostellar collapse, thermonuclear ignition temperatures are not attained solely by the in fall of matter; an additional shock wave-induced sudden flare-up is assumed."[51] In the nebular hypothesis, it takes a star to make a star. The nebular hypothesis has not explained how stars first formed.

Since the nebular hypothesis has been fashionable off and on for over two centuries, but has not explained the origins of stars or planetary systems, why don't its advocates abandon it? One reason is that the only viable alternative is biblical creation, or at least unknown mechanisms. Another reason is that the nebular hypothesis is a *model*, a way of visualizing the cosmic past. As a model, science *alone* cannot disprove it, because any necessary *ad hoc* assumptions can be generated as needed, a point considered in the next section. Supposing the pre-existence of collapsing clouds and functioning stars to trigger the collapse of new clouds is an *ad hoc* assumption. Indeed, "If stars did not exist, it would be easy to prove

that this is what we expect", Geoffrey R. Burbidge once quipped.[52] Burbidge apparently understood that a model can incorporate *any* observations and can *never* be disproved by any of them. The impossibility of model disproof is also why advocates of the nebular hypothesis can continue to say, "There is strong evidence that star formation is going on at the present time."[53] It is easy to confuse theoretical or popular *assertions* of the truth of the nebular hypothesis with *observational evidence*, which is absent.

Evidence of cosmic dissolution

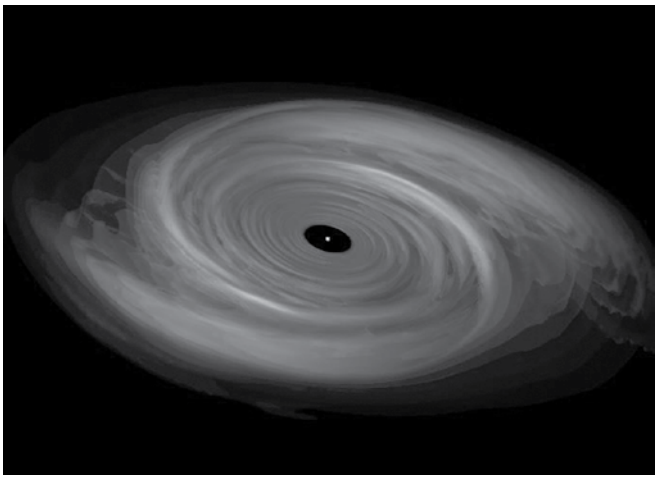
Astronomers observe debris in space *expanding*, but not nebular material collapsing. The outcome is that, "The theory for the expansion [of nebulae] has been progressing steadily ... but the theory for the collapse is in a poor state."[54] When theorizing about expansion, theorists describe a process which happens, but when theorizing about collapse—as for Bok Globules or T Tauri stars for which collapse and accretion are *inferred*—they are trying to explain a process which is unobserved and has evidently not occurred.

Rather than forming new stars, GMCs appear to be debris from the dissolution of existing stars. This is a not a rare process. "Classical novae [unstable stars] ... are sporadically injecting material processed by explosive nucleosynthesis into the interstellar medium."[55] Likewise, the process of star death is observed, but not star formation. That is why, "Exactly how a star like the sun [is] born, no one yet knows; the death of stars is better understood."[50] Rather than imagining star and planet formation on the assumption that the nebular hypothesis is true, a better view is that, "The entire life of a star is an aging process. ... Instead of stellar evolution, it might better be called stellar decay, degradation, or degeneration."[56]

No evidence of planetary systems forming

Besides giant molecular clouds, the debris near some stars is supposed to be an accretion site. New planets and planetary systems are supposedly forming in so-called *accretion disks* near these stars. The term *accretion disks* presumes that accretion of debris into planets is a reality. However, observation shows that stellar debris is expanding *away* from stars, not collapsing into more compact bodies, a fact already mentioned.

The nebular hypothesis also claims that interior heat in planets is consistent with the planets having been molten at the beginning of their evolution. But then *all* the planets should be releasing internal heat into space because, according to the nebular hypothesis, all experienced a common evolutionary origin. Most of the planets—and some moons—do indeed continue to release internal heat. Most of the outer planets are losing heat even *faster* than they receive it from the sun. But Uranus has no detectable heat loss from its interior.[57] Even if the solar system were as old as conventional chronology claims, there would not have been enough time for Uranus to have lost its internal heat—assuming it evolved according to the nebular hypothesis.



Drawing of an accretion disk around a T Tauri star (NASA). The accretion disk is supposed to be a region of planetary formation. Observation indicates that such material is instead a product of matter thrown off by the star in a process of dissolution rather than a process of accretion.

Lack of internal heat flow from Uranus suggests that the internal heat remaining in most planets (and moons) is not from an evolutionary process.[57] That is, this heat appears not to have been in the moons and planets from the beginning, thus challenging the nebular hypothesis. But wasn't the earth molten when first formed? This is conventional wisdom, but is actually a corollary of the nebular hypothesis, in which accretion involved conversion of kinetic energy of rapidly in-falling particles into heat. Since laboratory experiments have failed to show occurrence of accretion as a real physical process, this corollary is also questionable.

Further, evidence indicates that the solar system and the earth are *too young* for the nebular hypothesis to have had the billions of years it requires. The moon is receding slowly from the earth, a process called *lunar recession*; the moon is at most 1.3 Ga old, or it would have left earth orbit altogether.[58] Even more severe chronological constraints exist. Asteroids are presumed to be primordial material which did not form a planet, implying that asteroidal fragments are as old as the solar system. But the existence of asteroidal 'moons' suggests an upper limit on their age as low as 100,000 years, less than one ten-thousandth their conventional age.[59]

No matter the age of the moon, the nebular hypothesis cannot account for its existence, and

> "… astronomers still have to admit shamefacedly that they have little idea as to where it came from. This is particularly embarrassing, because the solution of the mystery was billed as one of the main goals of the US lunar exploration programme."[60]

Various lunar origins theories have been proposed, but each has failed.[61] Lunar scientist Irwin Shapiro joked that "the best explanation [of this failure] was observational error—the Moon does not exist."[62] More recently, lunar scientist Jack Lissauer recalled this anecdote as still applicable, even after widespread acceptance of the

T Tauri in Taurus, with a claimed age of 1 Ma, 462 light-years from Earth; spectral class F8-K1, visual magnitude 9.3-13.5, luminosity 3.7 times solar luminosity (NASA). The material surrounding T Tauri and similar stars is supposed to be experiencing accretion.

so-called impact theory of lunar origin.[62] Advocates of the nebular hypothesis sometimes express doubt that it can explain the origin of *any* planet or moon in the solar system, let alone the formation of *extrasolar planets* (*exoplanets*) found in orbit around other stars. One scientist described the nebular hypothesis as the 'best fit' to the observations, but added, "The argument is highly speculative and some of it borders on science fiction."[63] Another scientist noted,

> "The nebular hypothesis has three fatal flaws. First, it is very difficult to think of a way for the gaseous material [of the nebula] to coalesce into planets. It is much more likely that the pressure of the gas would cause the material to disperse into space. A second, very serious problem is that this theory predicts that the Sun would end up with most of the angular momentum in the solar system, instead of the very small amount it does have. The reason for this is that the material must have been rotating quite rapidly to have thrown off rings as it collapsed. Since most of the material ended up in the Sun, not in the planets, the Sun should still be spinning very fast. Finally, the nebular hypothesis does not explain the differences in composition between the giant and the terrestrial planets."[64]

Claims that these difficulties have been resolved are unreliable. For example, the angular momentum problem has been solved, according to McKee *et al.*,[65] but in fact "a proper understanding of the angular momentum evolution [of the sun] has not been reached."[66] Discoveries of many *trans-neptunian objects* (TNOs) farther from the sun than Pluto (one of the larger TNOs and of large TNOs, the closest to the sun) have weakened the case for the nebular hypothesis. For example, some TNOs are *binary pairs*, but (as with planets) their angular momentum is too high to allow formation from a nebula.[67] And though the nebular hypothesis led astronomers to expect that extrasolar planets must be forming around countless stars, detection of these planets has not helped the theory, for extrasolar planetary systems seem to bear little resemblance to the solar system.[68]

Models of the solar system's past

Accretion theory and the nebular hypothesis are *models* providing a way to visualize the solar system's history. *Biblical creation* is another model for visualizing solar system history. Though models cannot be confirmed or rejected from scientific data *alone*, biblical revelation may approve or condemn a model. For example, the Bible approves a creation model with God supernaturally *speaking* critical aspects of the cosmos into existence over six days,[69] not using a long process of cosmic evolution. Thus the Bible *dis-confirms* accretion theory and the nebular hypothesis. When the Bible speaks to a model, that model is confirmed or disconfirmed by *revelation*, not by scientific observation. Thus revelation provides guidance which science cannot.

The biblical view is that the creation began in a highly ordered state and has generally degraded since (Romans 8:20–22).[70] But accretion theory and the nebular hypothesis claim that solar system started in chaos and generally has evolved into a more complex condition. This is not the reality we experience every day. In real life, things spontaneously break down, degrade and decay—the working out of the Second Law of Thermodynamics. Thus accretion theory and the nebular hypothesis not only lack observational support from science, but are inconsistent with biblical revelation and common experience.

Read straightforwardly, Genesis 1 sets out certain *creation events* spanning six days which are unlike present natural processes. A simple inference from Genesis 1 is that the Creation Week involved events and processes we cannot observe now. For example, the Law of Matter and Energy Conservation states, "Matter and energy cannot be created or destroyed". This is true today, but matter and energy *were* created in Genesis 1. Since natural law says that today creation *cannot* occur, yet Genesis 1 says it *did*, Genesis 1 must *not* be a description of what natural law alone allows. The creation events in Genesis 1 were not wholly natural law processes. They did not follow *only* natural law, and natural law *alone* cannot describe them. Yet belief in accretion theory has become so popular that there is the temptation to assert God must have used it, possibly accelerating it 'supernaturally' to make it a viable process. But there are difficulties with inserting present-day

processes, even at vastly accelerated rates, into the Creation Week. We do *not* know that God employed any *creative* event during the Creation Week which *wholly* followed present-day natural law.

Further, we do *not* know that anything God did during the Creation Week was 'catastrophic'. Assuming catastrophism in the Creation Week imposes our present-day visualization of 'big and rapid' processes as *necessarily catastrophic* onto God's work during the Creation Week. Since God was powerful enough to create and control the entire cosmos, there is no reason to think that during the Creation Week He could not have accomplished His creative changes smoothly and calmly. Non-catastrophic creation events are consistent with His being a God who desires we do all "decently and in order" (1 Corinthians 14:40). The Flood, in contrast, was a judgment, and as such involved global turbulence, destruction and catastrophe. But imputing a diluvian catastrophism to the uplifting of land and other mega-events in the Creation Week is a uniformitarian extrapolation.

Even so, if accretion theory and the nebular hypothesis cannot explain the origin of the solar system, shouldn't creationists propose an alternative model? Actually, biblical creation *is* an alternative model, but this question usually means, "Don't creationists need to offer an alternative *naturalistic* model?"—i.e. one possibly involving a divine start-up but relying only on natural processes after that. The answer is *No*. Showing that a theory is not workable does not impose the requirement to provide a replacement. Refuting Darwinism, science writer Richard Milton said,

> "Some people have said to me, how can you criticize a theory if you don't have something to replace it with? Well, I don't accept that. If the emperor hasn't got any clothes on, then the emperor hasn't got any clothes on. It's not my fault. It seems to me that if Darwinism is wrong, then somebody has got to point the finger."[71]

Even more fundamentally, there is no reason *other than personal preference* why the replacement for accretion theory and the nebular hypothesis must be another naturalistic model. The creation model is not a naturalistic model, and it does not need to be made into one:

> "A mistaken alternative is to assume that naturalistic processes can be reconciled with fiat creation by shortening the timescale to fit within a literal Creation Week. A naturalistic process impossible over eons is less likely over days, and to say that God accomplished the naturalistic process quickly is to verge on a kind of 'theistic naturalism.' Naturalistic origins theory … should be seen for what it is—an attempt to rob God of the glory of creating His universe by mechanisms not subject to natural law and which natural law will never explain."[72]

Accretion theory and the nebular hypothesis also require conditions that natural law has not been shown to be capable of providing, such as artificially low collision velocities between accreting particles. Outside of scientific discussion, such physically impossible conditions are called *miracles*, implying that the origin of the heavenly bodies was a supernatural event, the claim the Bible makes.

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