Heavenly Bodies, Earthly Politics: The Nebular Hypothesis and the Mid-Victorian Press (1844–1846)

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Introduction

Today, the idea that our solar system was formed from a collapsing nebula - a self-gravitating cloud of luminous matter - is widely accepted. This so-called 'nebular hypothesis', first proposed by Immanuel Kant in 1755, gained the impetus of empirical support when Sir William Herschel observed these nebulae - or "stellar cradles" - in the late eighteenth century (Figure 4).

In 1844, the anonymously published *Vestiges of the Natural History of Creation* presented the nebular hypothesis in its opening chapter, using it as the opening act of a sweeping developmental narrative —the first known attempt to "connect the natural sciences in a history of creation" [3]. The book's evolutionary narrative—accounting for the transmutation of species without the intervention of God, and grounding morality in "the absolute identity of the brain with a galvanic battery"—proved

too much for many Victorian readers. While the *Examiner* hailed it as “extraordinary,” the *Edinburgh Review* complained that it “bound the Divinity in chains of fatalism,” and the *Waterford Chronicle* denounced it as “audacious infidelity” [4], [5], [6].

The press response to this work provides a compelling case study in the public reception of science, redressing the absence of scholarship on the role of the press in the diffusion of science first noted by Cooter and Pumfrey in 1994 [7]. Studies of science in popular contexts have emphasized that knowledge is not produced by scientists alone, but co-produced by authors, reviewers, and diverse publics [7], [8]. Indeed, the reception of *Vestiges* in the British Press shows debates over cosmic origins became proxies for theological, social and political battles. More concretely, the origin of solar system came to have a direct bearing on the following questions: Can morality exist in a materialist universe? Is a God who interferes in his creation greater or lesser than one who does not? Do miracles exist? And finally - who should have the power to participate science, and who should be allowed to speak on behalf of it?

Before turning to the British press, we shall briefly outline the presentation of the nebular hypothesis in *Vestiges* (see Figure 1 and Figure 2). Drawing on what had long been ‘common knowledge’ among astronomers and geologists, the author starts by introducing the nebulae - remarkable celestial objects with a “foggy appearance” (see Figure 4), noting that they exist “in every stage of concentration”, from an extremely diffuse blob to “a common star with a slight *blur* around it” [3, p. 8]. This suggests that nebulae are “but stages in a progress,” much as if, “seeing a child, a boy, a youth, a middle-aged, and an old man together, we might presume that the whole were only variations of one being” [3, p. 8]

The book then adduces a number of empirical regularities in the solar system—the relative distances of planets from the sun, the fact that all planets orbit in the same direction and in the same plane, and several more obscure ones, to support the theory that the solar system was created from a collapsing cloud of luminous matter (Figure 1 and Figure 2).

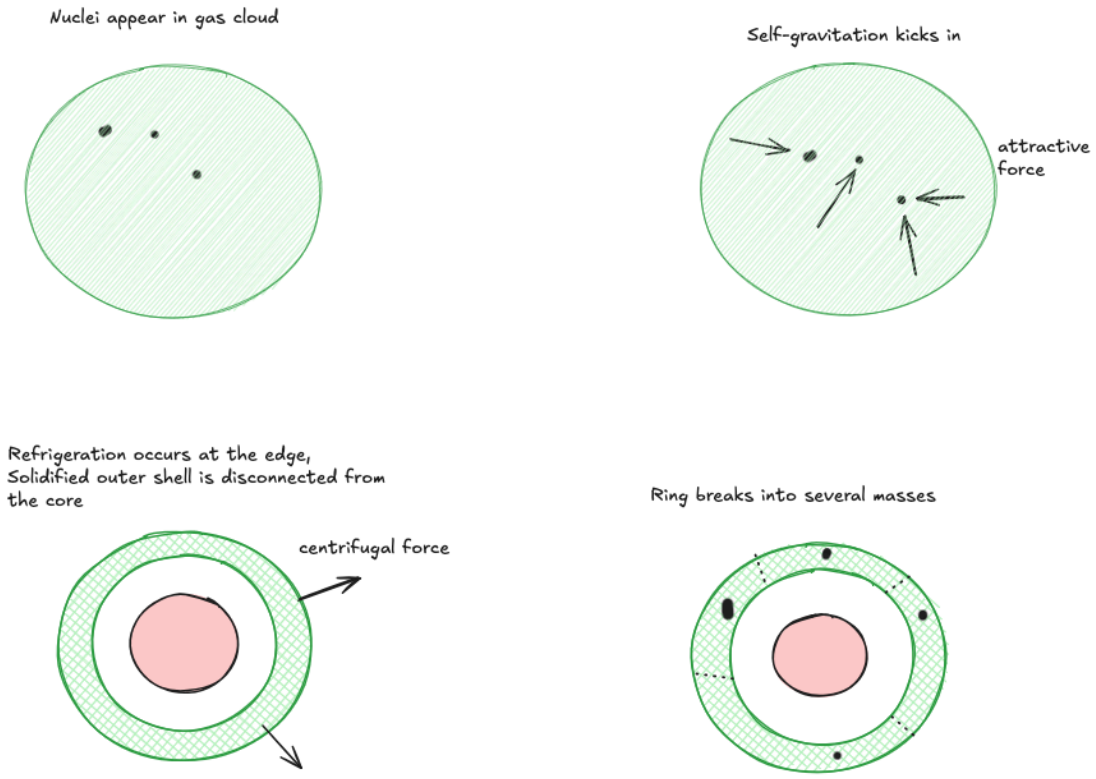

Figure 1: The nebular hypothesis (I): gravitational collapse of a luminous nebula into a central proto-sun through self-gravitation and centrifugal force.

The book then addresses several implications from the nebular hypothesis, the first one being that "the Earth is older than Venus and Mercury, but younger than Mars, Jupiter, Saturn, and Uranus". But if our solar system evolved from a nebula, is it still evolving? *Vestiges* is ambivalent: On the one hand, there are "mathematical reasons [...] concluding that Mercury is the nearest planet to the sun, which can, according to the laws of the system, exist" [3, p. 6], suggesting that our solar system is "complete", and static. On the other hand, the "Zodiacal Light" reveals "the comparative youth of our system", suggesting that it is "one whose various phenomena, physical and moral, as yet lay undeveloped" [3, p. 22]. Thus the chapter concludes with two views of the future: the first is static because our system is "completed", the second is in progress, and moving towards a better state. *Vestiges* picks up on the implications of the improvable system in a later chapter on human evolution:

> "Is our race but the initial of the grand crowning type? Are there yet to be species superior to us in organization, purer in feeling, more powerful in device and act, and who shall take a rule over us? There is in this nothing improbable on other grounds.
>
> — *Vestiges of the Natural History of Creation*, [3, p. 276]

The chapter concludes that the hypothesis is "supported by so many ascertained features of the celestial scenery, and by so many calculations of exact science, that it is impossible for a candid mind to refrain from giving it a cordial reception."

But as we shall see, the reception in the British press was anything but cordial.

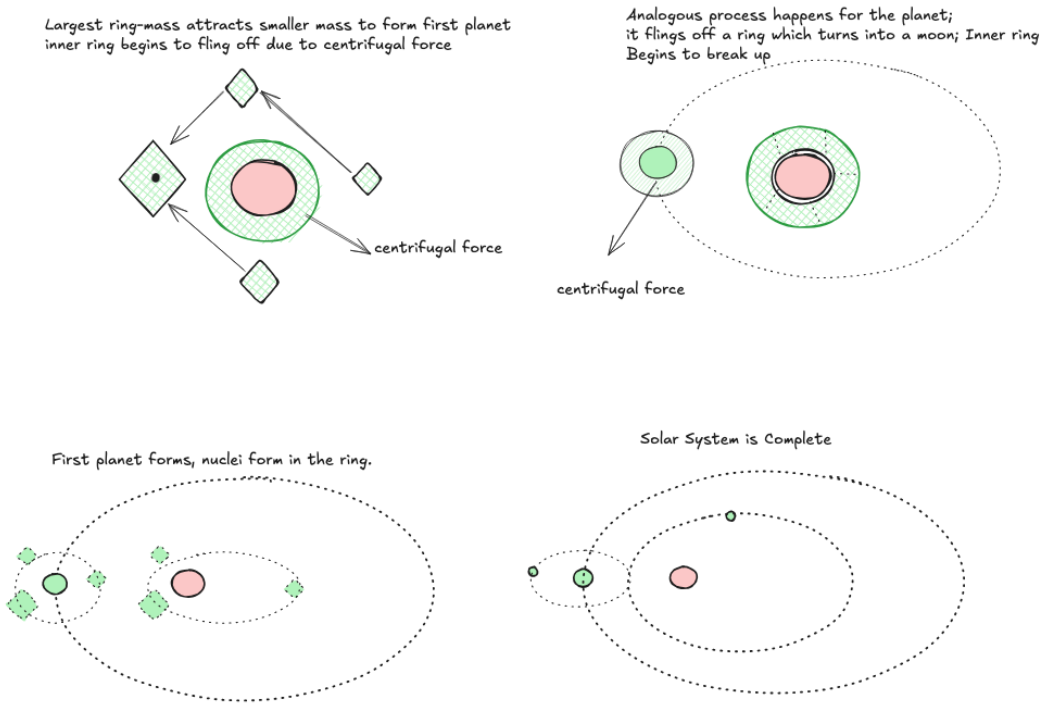

Figure 2: The nebular hypothesis (II): planetary formation through the detachment and condensation of rotating rings of matter, resulting in the 'completion' of the solar system.

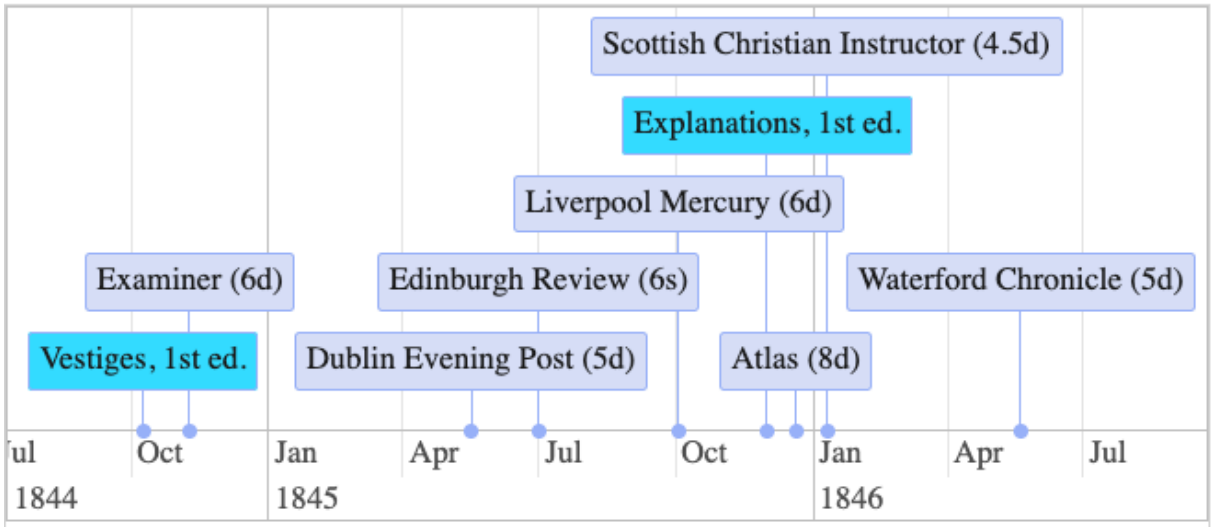

Figure 3: Publication timeline of the articles discussed, including prices (d=pence, s=shilling. 12d=1s)

1 The Radical *Examiner*: unfinished solar system, unfinished political progress

The first review of the *Vestiges* was an effusive eulogy in the London-based *Examiner*:

> In this small and unpretending volume we have found so many great results of knowledge and reflection, that we cannot too earnestly recommend it to the attention of thoughtful men.

— *The Examiner*
November 9th, 1844 [4]

Self-described as a "leading intellectual journal expounding radical principles" [9], the *Examiner* was read by an educated, well-to-do urban intellectual elite. It was politically active in the Reformist campaign that led to the expansion of the franchise in the Reform Act of 1832 [10], and dedicated ample space to celebrating various "death-blows" to Toryism in minor by-elections across England [11].

As we saw, *Vestiges* presents competing pictures of the solar system: the first is "completed", the second is still developing. Pointedly, the *Examiner* only presents the latter system, adding that "there is evidence, *altogether apart from human traditions*" (emphasis mine) that there is much moral progress to be made in the "system". It is deliberately left to the reader to infer whether "system" refers to the solar or political one.

The *Examiner* then continues to drive the point home that arguments from astronomy seem to herald great Progress around the corner:

> it is necessary to suppose that the present system is but a part of a whole, a stage in a Great Progress, and that the Redress is in reserve.
>
> — *The Examiner*
> November 9th, 1844 [4]

The *Examiner* thus appropriates popular astronomy to validate a Reformist vision of the future: Just as the work of radical reformers was not complete with the Reform Act of 1832, so too the Creator's work remained unfinished in the present state of the solar system.

2 The *Dublin Evening Post, Scottish Christian Instructor, & Waterford Chronicle*: wrongful allegations, materialism, the denigration of Man & the Leviathan of Parsonstown

On May 15th 1845, John Pringle Nichol—clergyman, political economist, and author of the popular *Architecture of the Heavens* (1837)—opened the *Dublin Evening Post* to find himself accused of "infidelity, atheism, and materialism" [12]. The *Post* noted that "the paternity of the book was generally attributed to [Mr Nichol]". The suspicion was not arbitrary: The similarities between Nichol's *Architecture* and the first chapter of *Vestiges* were widely remarked upon in the press, the *Liverpool Mercury* writing that *Vestiges* appeared to have taken it "cut and dry" from Nichol's book [13].

The misidentification is revealing. What had been an uncontroversial cosmological speculation in 1837 had, by 1844, become inseparable from accusations of irreligion. Its employment in a broader developmental narrative was to blame. Nichol moved quickly to clear his name, denying authorship in a letter to the *Post* while pointedly refusing to comment on "the justice or injustice" of the charges against the book. The *Post* apologized [12]. Nichol's caution itself is telling: even denial required careful calibration, as public engagement carried the risk of reputational damage.

The very concept of 'sin' is predicated on free will. Yet *Vestiges* proposed "the absolute identity of the brain with a galvanic battery" [3, p. 334], leading the outraged *Waterford Chronicle* to lament that it was "reducing morality to a mechanical process" [6]. The *Scottish Christian Instructor* similarly

warned that the work aimed “to do damage to the moral constitution of man” [14], by depicting humanity as “nothing else but the earthly descendant of a cyclo-neura… or a snail”. For the clerical press, Catholic or Protestant, the nebular hypothesis was nothing but the first erroneous step in a chain of “gross materialism” that threatened the precious providential order in which “all manifestations of nature” expressed “a relationship between God and Man” [15].

Secular papers like the *Liverpool Mercury* and *Atlas* agreed that *Vestiges* raised important theological questions. However, they tended to avoid directly responding to the clergy’s claim that materialism had dire implications for human moral agency and responsibility. They may have avoided these questions because this was precisely where the theological critique was most difficult to answer. The relationship between atheism and moral objectivity remains contested in contemporary philosophy, with some defending secular moral realism [16], others grounding morality in theism [17], and still others rejecting objective morality altogether [18]. Within the constraints of the periodical press, such foundational questions could be raised, but not satisfactorily answered. Instead, the *Mercury* simply dismissed the “cuckoo charges of materialism” as a smokescreen, whereas the *Atlas* reframed the core theological tension by asking whether the Almighty is supposed to be “greater” when he acts only through general laws rather than individual miracles.

The cultural uproar against materialism partly legitimated the quest to reproduce the observations by Sir William and John Herschel, which in the absence of photography relied on the testimony of skilled observers. This resulted in the construction of the largest telescope that had ever been built, now known as the *Leviathan of Parsonstown*, in Birr, in rural Ireland [19]. Many of the “nebulae” from the Herschell catalogue were reportedly resolved into individual stars - they were not gaseous and could therefore not undergo the gravitational collapse necessary to produce a new solar system, raising a key objection to the hypothesis. The *Leviathan* had even purportedly resolved *Orion*, a striking example of confirmation bias considering that we now know *Orion* is, in fact, a real gaseous nebula [19].

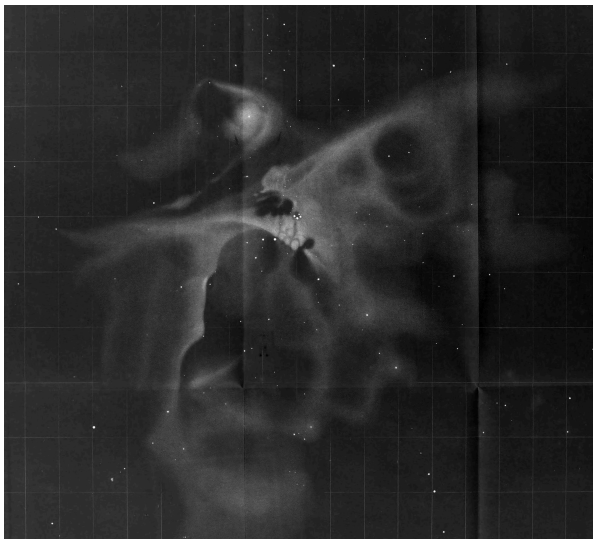

Figure 4: John Herschel’s, *Orion Nebula Drawing*, 1835 [1, p. 508].

Figure 5: The *Leviathan of Parsonstown*. Working Men’s Educational Union, 1853 [2]

3 The authoritative *Edinburgh Review* declares open war on the book, reasserting the boundaries of 'respectable science' and its popularization

The *Edinburgh Review* was a pioneer of steam printing in the early nineteenth century, becoming one of the most influential periodicals of the age [20]. As a Quarterly publication it was long (reviews could reach 80 pages) and expensive (its six shilling[1] price tag made it thirteen times more expensive than a copy of the *Examiner*). It was therefore meant to be kept as a reference. Indeed, the *Edinburgh* was so authoritative that it defined the long-term fate of books [21]. Among its subscribers was Adam Sedgwick, a prominent geologist, Anglican priest, and mentor to Charles Darwin.

Sedgwick had strong feelings about the book, and hoped that an authoritative rebuttal would stamp "with an iron heel upon the head of the filthy abortion, and put an end to its crawlings" [21]. When approached by editor of the *Edinburgh* to author one, he obliged with a lengthy, unrelenting attack that lived up to the magazine's nickname, "The Thunderer"[2]

> The world cannot bear to be turned upside down; and we are ready to wage an internecine war with any violation of our modest principles and manners
>
> — *Edinburgh Review*, July 1845 [5]

James Secord has argued that Sedgwick was partly motivated by fears of an anti-science conservative counterreaction from the "Tory diehards" within the Church [21]. After all, geologists like Sedgwick were making discoveries that threatened a literal interpretation of Genesis [22]. The *Liverpool Mercury* picked up on this, explaining Sedgwick's inordinate ire by the fact that the Dean of York had unfairly heaped charges of "infidelity and materialism, […] on his favorite pursuit, Geology" [13]. Perhaps, the *Mercury* mused, a "mere anonymous bookmaker might well be sacrificed to evidence the orthodoxy of a Cambridge divine".

Thus, Sedgwick felt it necessary to distance the scientific establishment from *Vestiges*, claiming that:

> No man who has any name in science, properly so called, whether derived from profound study, or original labour in the field, has spoken well of the book.
>
> — *Edinburgh Review*, July 1845 [5]

Reading this, we surmise the Nichol was glad he had refrained from commenting in the *Dublin Evening Post*[3] the previous winter.

Whereas *Vestiges* presents the nebular hypothesis as an "ascertained truth", Sedgwick calls it "a splendid vision". It is not dismissed as untrue as much as unfounded: "after five hundred years of continued observation [it] *may* pass into a substantial theory" (emphasis mine). The failure to account for the large amount of angular momentum in the solar system constitutes the anonymous author's "first great blunder" [23], the first of many.

But Sedgwick was not merely worried about being misunderstood by clerical literalists. He understood that science was "the most potent instrument of persuasion in our culture" [24], and

[1] See Figure 3 for the prices of the newspapers under discussion

[2] Its motto was *Judex Damnatur Cum Nocens Absolvitur*, or *The Judges are Condemned when the Guilty are Absolved*

[3] see Section 2

earnestly believed that books like *Vestiges*, masquerading in the conventions of gentlemanly writing, would lead the public down the dangerous conclusions inferred from its "degrading materialism". This public is portrayed as gullible, "men who are fed on nothing but the trash of literature" - and since they "are not able to judge from their own knowledge, [they] must therefore be plainly told" that *Vestiges* is not real science.

Sedgwick warns that materialism, if taken up by the working classes, would bring "ruin and confusion", "undermine the whole moral and social fabric," and introduce "discord and deadly mischief in its train." The fear of a French-style revolution is palpable: We must protect "our glorious maidens" from books that "teach that their Bible is a fable when it teaches them that they were made in the image of God - that they are the children of Apes and the breeders of monsters" [5, p. 3].

As Secord has explained, Sedgwick valued the "diffusion of knowledge from *credible* sources" (emphasis mine) [21]. He therefore reasserts not only who is allowed to do science, but also who is allowed to disseminate it. People who have not learned the lessons of "humility" from "their own repeated failures", who have not "learned to appreciate the enormous and continued labour by which every new position has been won", should not be allowed to "toss their fantastical crudities before the public" [23, p. 4]. True science is cautious, laborious, and manly - "ill-fitted for the drapery of a petticoat" [23, p. 3].

Gillian Beer has suggested that Adam Sedgwick's attack may have nudged his former pupil, Charles Darwin [15], to delay the publication of his own speculations. Although Darwin had largely formulated his theory of evolution by natural selection by 1844, he chose not to publish it, embarking instead on an extended eight-year program of empirical work on barnacles to further test and refine his theory. Nevertheless, Sedgwick would react with similar hostility to the publication of *On the Origin of Species*, writing to his former pupil: "You have *deserted* the true method of induction." [25]

4 The Dissenting *Liverpool Mercury* lampoons Sedgwick, revealing hypocrisy of 'Cambridge Schoolmen'

We now turn to the voice of the English industrial North: the *Liverpool Mercury* was a self-consciously "provincial" paper, read by the merchants and shopkeepers lifted by the rising tide of the industrial revolution [26]. Many northerners were Dissenters, barred from Oxford and Cambridge. It was precisely these upwardly mobile readers that Sedgwick had surmised were being "fed on nothing but the trash of literature" [23]. The Mercury's motto, *Salus Populi Lex Suprema*[4], reflected the *Mercury*'s commitment to "continual and peaceful progress" [27].

In contrast to the *Post* and the *Edinburgh*, who reacted with "deep odium" to the "degrading materialism" of the work, the *Mercury* is positive, although it stops well short of the *Examiner's* effusive praise. Instead, it approves of the spirit of the "much-abused little book", calling its attention "well-deserved". It expresses "regret" that the "speculative opinions hazarded by the author […] should have been met in such an intolerant spirit". In effect, the *Mercury* provides a tongue-in-cheek 'review-of-the-review', sarcastically undermining Sedgwick's critical hit-piece in the *Edinburgh*:

> It is, however, not a little curious, that while the nebular theory was locked up from vulgar eyes […] it was held as a talismanic gem of the first water […] But no sooner had Nichol […] transferred it, brilliantly re-set, to his pert little duodecimo, than it was discovered that the gem

[4]The welfare of the people is the supreme law

> contained some flaws […] But now that the author of the "Vestiges," in his turn, has taken it, cut and dry […] to make it work out its seeming destiny in his own pages, it is discovered to be mere paste […]
>
> — *Liverpool Mercury*,
> Friday, 17 October 1845 [13]

The Cambridge schoolmen appeared to change their mind about a hypothesis purely on the basis of who was saying it. The readership of the *Mercury* likely admired the anonymous author of *Vestiges*, who is clearly well-read and educated, though lacking in first-hand scientific experience. Why shouldn't upstarts like him be allowed to speculate on the origin and fate of the Universe?

The *Mercury* seizes the opportunity to satirize Sedwick's "theory-phobia". What appear to the *Mercury* as "harmless, really inoffensive speculations", Sedgwick says are at "open war with all the calm lessons of inductive truth":

> If Columbus had published his Theory of the Discovery of America in a pamphlet, the Rev. Professor would have demolished it in a good set speech, […] and would […] have blandly told him […] that he had no "right to toss out his fantastical crudities before the public, and give himself the airs of a legislator over the material world."
>
> — *Liverpool Mercury*,
> Friday, 17 October 1845 [13]

For the *Mercury*'s commercially-minded readership, the "Cambridge schoolmen" were simply being pedantic. A theory was more akin to a business plan: you need one to move forward, even if imperfect. In contrast, for Sedgwick, a theory could only be won by "enormous and continued labor". The *Mercury* similarly dismisses Sedgwick's cry of "degrading materialism":

> In polemics or criticism nothing can be more unfair than to raise the hue and cry of materialism. It implies, not seldom, a lack of sounder argument in those having recourse to it,
>
> — *Liverpool Mercury*,
> Friday, 17 October 1845 [13]

Thus, the *Mercury* understandably refracts the nebular hypothesis through the prism of class warfare: Just like the Reform Act of 1832 had wrested power from the entrenched "Old Blood" of the English southern aristocracy, the same battle lines are revealed in the dishonest and hypocritical attack on the anonymously published book. Their "internecine war" declared against the nebular hypothesis reveals the schoolmen's hidden agenda: to restrict the "narrow and thorny entrance through which we may lawfully approach" natural science, and restrict who is allowed to credibly speak on behalf of it [23].

To the *Mercury*, the cry of materialism and the insistence on inductive caution were simply tools to exclude large segments from an active engagement with science and its diffusion.

5 The critical but measured *Atlas* does important cultural work in 'removing prejudice' for Charles Darwin's ideas.

The fierce debate prompted Robert Chambers, the anonymous author of *Vestiges*, to keep publishing revised editions of his work. *Vestiges* eventually totalled 14 editions. Chambers also published a

sequel called *Explanations*, which incorporated and responded to many of the criticisms levelled in the press [21]. This iterative process of production, incorporating what historian Natalie Zemon Davis has called "the creative competence of the lower orders" [28, p. 225] is a testament to the importance of co-production in popular science.

Mirroring the approach in the *Liverpool Mercury*, *Explanations* uses the words of the establishment scientists against them, showing that they had privately agreed to theories that they were now vehemently opposing.

The *Vestiges* and *Explanations* were jointly reviewed in late 1845 in the *Atlas* [29]. A self-styled "Journal of Literature", it was London's most expensive weekly, costing eightpence. The *Atlas* shared the *Examiner*'s Liberal-Whig sympathies but it kept its distance from the fray of everyday politics and adopted a highbrow and philosophical tone.

The *Atlas* review is critical but measured. The *Vestiges* is referred to as a "Frankenstein", but the criticisms of "scientific caution" and "theory phobia" of the *Liverpool Mercury* are also given their due, albeit with more detachment:

> Modern teachers had been used so long to the Baconian go-cart, that they had become [...] apprehensive of losing the inductive clue [...] But the time had arrived [...] to relax [...] and afford scope for a more systematic, if not speculative research.
>
> — *The Atlas*, 20 December 1845

The key empirical challenge to the nebular hypothesis, according to the *Atlas*, was the fact that the Earl of Rosse's *Leviathan* telescope (see Figure 5) had cast serious doubt on the very existence of nebulae as clouds of gas, by resolving many of the supposed nebulae from the Herschel catalogue into individual stars that were too difficult to see with weaker telescopes.

The *Atlas* then turns to the bearings of the theory on God, a topic in which "popular feelings are likely to be most deeply interested". As we mentioned in Section 2, the *Atlas* does not engage deeply with the implications of a detached God for human morality. Instead it asks, first, whether miracles or "special interventions" occur at all. And second, what *Vestiges*' naturalism means for our "estimate of the Divine character" [29]? On the first question, it notes that "there are names of no mean repute who would reserve certain domains of creation as the fields of special interventions". On the second question, we read that *Explanations* appeals to the 18th century Nonconformist minister Phillip Doddridge:

> No, there is nothing atheistic, nothing irreligious, in the attempt to conceive creation, as well as reproduction, carried on by universal laws.
>
> — Rev. Phillip Doddridge, as quoted in [29]

In the "Historical Sketch" of the 1871 re-publication of the *Origin of Species*, Charles Darwin acknowledged *Vestiges* "has done excellent service in this country in calling attention to the subject, in removing prejudice, and in thus preparing the ground for the reception of analogous views" [30]. The *Atlas* review—neither overtly political like the *Examiner*, nor fuming like the *Edinburgh*, but measured and philosophical—helped confer a new mainstream propriety on these discussions. No longer confined to astronomy enthusiasts, political radicals, crusading clergy, or gentleman scientists, the subject entered polite conversation. In this sense, the *Atlas* review marks the critical point in public opinion that Darwin would comment on decades later: what Sedgwick had denounced as a "filthy abortion" had become a fashionable, even sophisticated topic.

Conclusion

We have seen how a range of publics— Radicals, Catholics, Gentlemen-scientists, and Dissenting northerners refracted the debate over the origin of the solar system through distinct political agendas and moral commitments. Our analysis echoes Bensaude-Vincent's argument that, in studies of science popularization, the generic term "public" is better replaced by the political category of "citizens," understood as a "variety of motivated individuals or informed groups, acting as responsible actors and members of civil society" [31].

To the *Examiner*, the morally uncompleted solar system reflects the moral and political battles that have yet to be won against the Tories. To the *Liverpool Mercury*, the extreme reaction from the 'Cambridge schoolmen' betrayed their elitist attitudes and unfair gatekeeping. The *Edinburgh Review* reveals the fear of a "French-revolution"-style moral collapse, and a battle over who is allowed to participate in and communicate scientific discoveries. Finally, the religious press, in the *Dublin Evening Post*, *Scottish Christian Instructor*, and *Waterford Chronicle* shows that pious Catholics and Protestants were more concerned by the implications of materialistic natural law on the dignity of *Man* than on our conception of *God*, a concern that the secular press like the *Atlas* and *Examiner* either deflected or left unaddressed.

The outcry over Vestiges encouraged Darwin to take a more cautious, inductive approach and contributed to the broader social legitimation of the construction of the giant Leviathan of Parsonstown (Figure 5). Today, the Leviathan is remembered for extending the observable universe beyond the Milky Way, radically increasing the size of the known cosmos [19].

This essay has shown that newspaper readers and anonymous columnists were not passive commentators on these developments, but active participants in shaping both the meaning of popular science and the trajectory of scientific practice itself.

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