Piety, Politics, and the nebular hypothesis in the British Press 1844-1846

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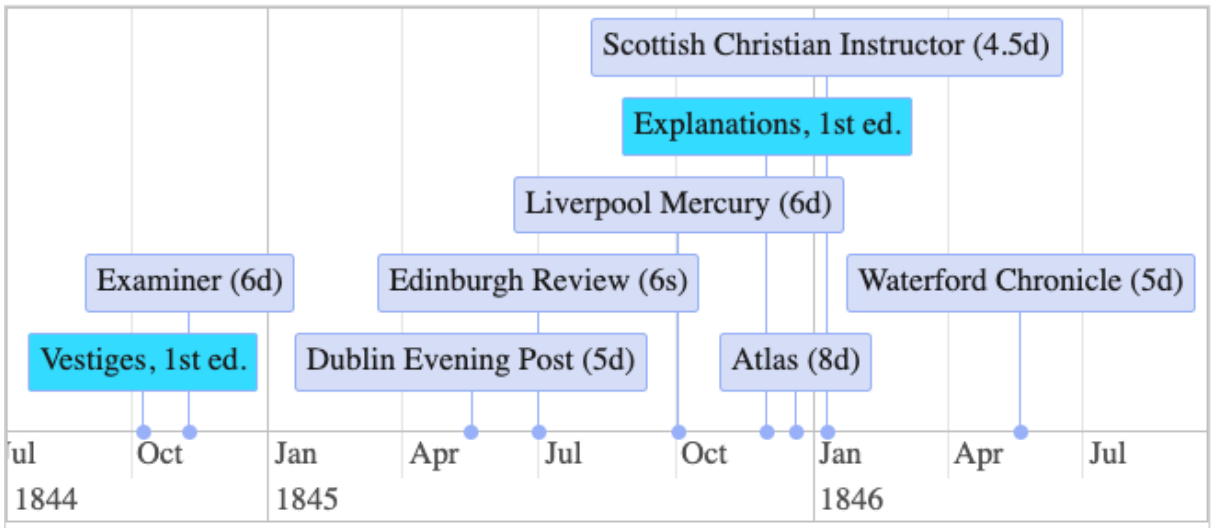

Figure 1: Publication timeline of the articles discussed, including prices (d=pence, s=shilling. 12d=1s)

Introduction

Today, the idea that our solar system was formed from a collapsing nebula - a self-gravitating cloud of luminous matter - is accepted scientific fact. This so-called 'nebular hypothesis', first proposed by Immanuel Kant in 1755, gained the impetus of empirical support when Sir William Herschel first observed the "stellar cradles" in the late eighteenth century (Figure 2)

In 1844, the anonymously published *Vestiges of the Natural History of Creation* presented the nebular hypothesis in its opening chapter, using it as the first chapter of a sweeping developmental narrative —the first known attempt to "connect the natural sciences in a history of creation" [3]. Its sweeping 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 of popular science 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]. The reception of *Vestiges* offers a striking example of this process. Its sensational reception—across radical, religious, and establishment periodicals—shows how the nebular hypothesis was refracted through competing political and moral commitments. In this context, debates over cosmic origins became proxies for theological and social battles. The origin of solar system thus came to have a direct bearing on the following theological, political, and social questions: Can morality exist in a materialist universe? Is a God who interferes in his creation greater or lesser than one who does not? And finally - who should have the power to participate in and disseminate scientific discourse?

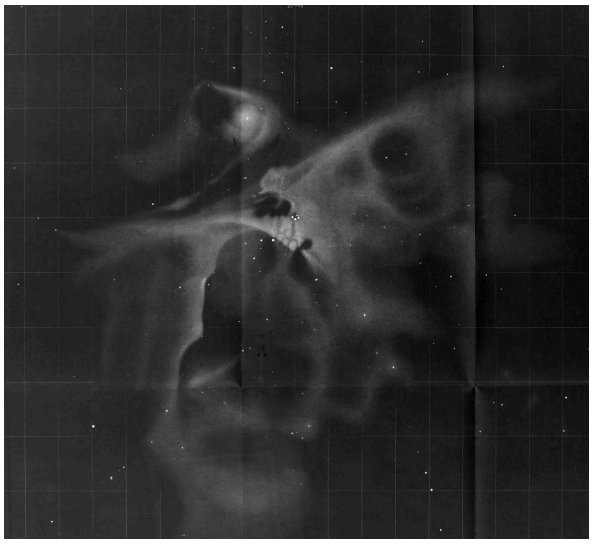

Figure 2: John Herschel's, *Orion Nebula Drawing*, 1835 [1, p. 508]. Lord Rosse believed that his *Leviathan* (Figure 3) could resolve the cloud into individual stars, thus disproving the existence of nebulae.

Figure 3: Leviathan of Parsonstown. Working Men's Educational Union, 1853 [2]

The nebular hypothesis in Vestiges

Before turning to the British press, we shall briefly outline the presentation of the nebular hypothesis in *Vestiges* (see Figure 4 and Figure 5). Drawing on what had long been 'common knowledge' among astronomers and geologists, the anonymous author starts by introducing the nebulae - remarkable celestial objects with a "foggy appearance" (see Figure 2), 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."

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 the sun in the same direction and in the same plane, and a few more obscure empirical regularities, to support the theory that the solar system was created from a collapsing cloud of luminous matter.

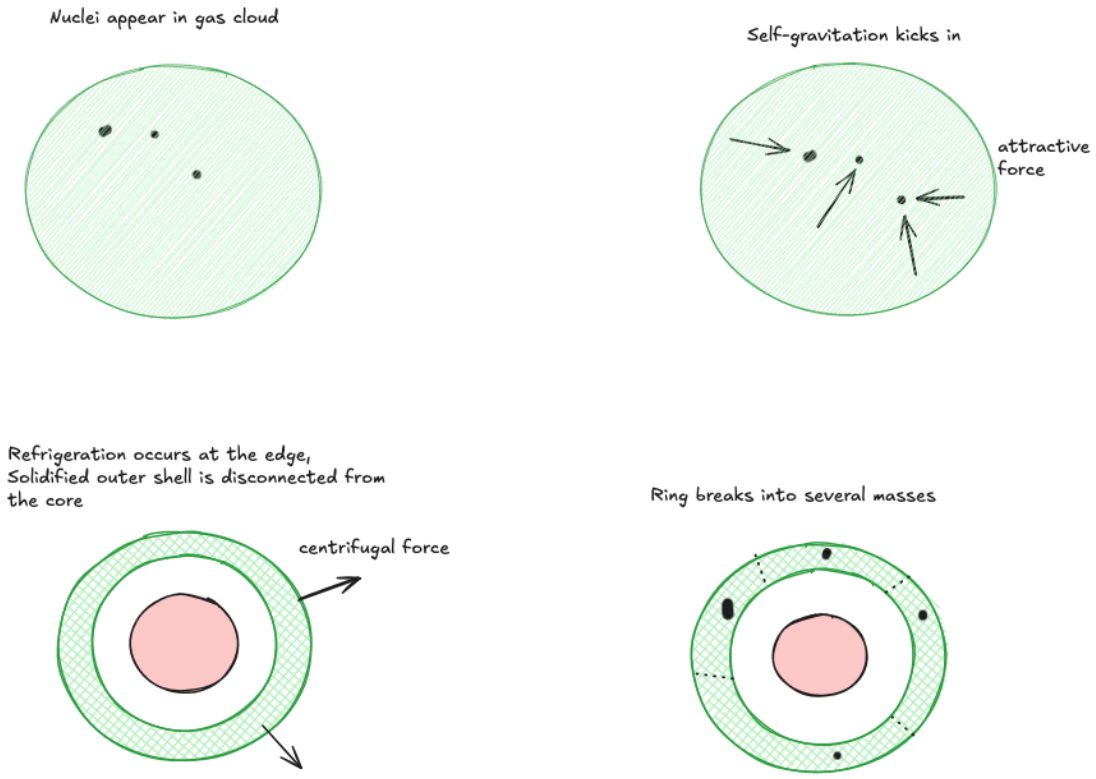

Figure 4: The nebular hypothesis (I): gravitational collapse of a luminous nebula into a central proto-sun through self-gravitation and centrifugal force.

One of the implications from the nebular hypothesis is 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* addresses the question ambivalently: 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" is provided as evidence for "the comparative youth of our system", suggesting that it is "one whose various phenomena, physical and moral, as yet lay undeveloped, while myriads of others were fully fashioned and in complete arrangement." [3, p. 22]. Thus the chapter concludes with two views of the future, the first is static because our system is "completed" whereas the other one is continually improving. *Vestiges* picks up the thread of an evolving system again 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." As we shall see, the reception of *Vestiges* was anything but cordial.

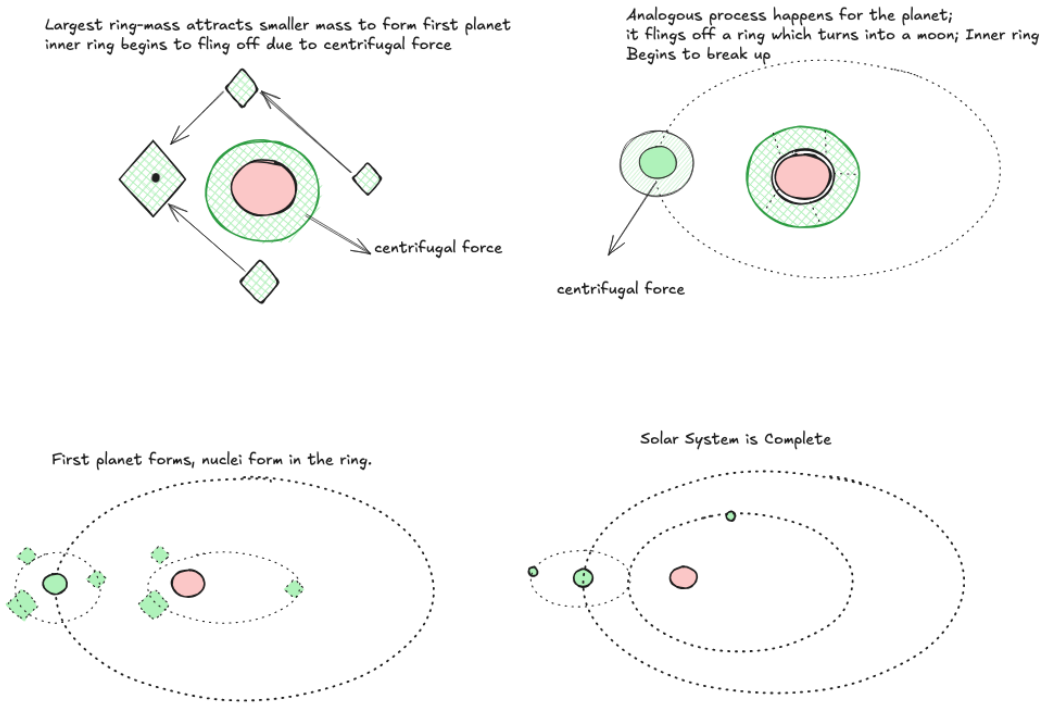

Figure 5: The nebular hypothesis (II): planetary formation through the detachment and condensation of rotating rings of matter, resulting in the 'completion' of the solar system. Or is it still incomplete? The *Vestiges* leaves this question open.

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. 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 accusations, fears of materialism, and the denigration of Man

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, including by the *Liverpool Mercury* [13], who wrote that the anonymous author appeared to have taken it "cut and dry" from Nichol's book.

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 editor while pointedly refusing to comment on "the justice or injustice" of the charges against the book. The *Post* apologized, but Nichol's caution itself is telling: even denial required careful calibration, as public engagement carried the risk of reputational damage [12].

The very concept of 'sin' is predicated on free will. Yet *Vestiges* proposed "the absolute identity of the brain with a galvanic battery", leading the outraged *Waterford Chronicle* to complain that it was "reducing morality to a mechanical process" [3, p. 334], [6]. The *Scottish Christian Instructor* similarly warned that the work aimed "to do damage to the moral constitution of man" [14], depicting humanity as "nothing else but the earthly descendant of a cyclo-neura… or a snail". For the clerical press, catholic and protestant, the nebular hypothesis was nothing but the first erroneous step in a chain of "gross materialism" that threatened the 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 main line of attack, namely, the implications of materialism 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 others rejecting objective morality altogether [18]. Within the constraints of the periodical press, such foundational questions could be raised, but not easily resolved. Instead, the *Atlas* and *Mercury* shifted the theological debate to whether our image of God

is more or less exalted when we assume he only acts through general laws rather than acting through specific miracles.

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 1800s, becoming one of the most influential periodicals of the age [19]. As a Quarterly publication it was long (some reviews could reach 80 pages) and expensive: Its six shilling 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 it was so authoritative that it defined the long-term fate of books [20]. 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" [20]. 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":

> 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 [20]. After all, geologists like Sedgwick were making discoveries that threatened a literal interpretation of Genesis [21]. The *Liverpool Mercury* picked up on this as well, 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]

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" [22], 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" [23], and was therefore worried that books like *Vestiges*, masquerading in the conventions of gentlemanly writing, will 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) [20]. 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" [22, p. 4]. True science is cautious, laborious, and manly - "ill-fitted for the drapery of a petticoat" [22, 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 instead embarked on an extended eight-year program of empirical work on barnacles, thereby strengthening his theory before releasing it to the public.

Sedgwick would later 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." [24]

4 The Dissenting *Liverpool Mercury* lampoons Adam Sedgwick and the 'Cambridge Schoolmen'

We now turn to the voice of the industrial English 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 [25]. Many of these readers were Dissenters barred from Oxford and Cambridge, and they shared the Examiner's appetite for social reform. The Mercury's motto, Salus Populi Lex Suprema[1], reflected a commitment to "continual and peaceful progress" [26]. While just as radical as its metropolitan counterparts, its focus remained firmly on commerce, politics, and the specific interests of the North. It was precisely these upwardly mobile readers that Sedgwick had surmised were being "fed on nothing but the trash of literature" [22].

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* earnest and effusive praise. Instead, the *Mercury* 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

[1]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 *Mercury* reveals that 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 these upstarts be allowed to speculate on the origin and fate of the Universe?

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

> 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 being pedantic. A theory was more akin to a business plan: you need one to move forward, even if imperfect. 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 drawn in the reception of this 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 science [22].

5 The Sophisticated *Atlas*' critical but even-handed commentary legitimates the *Vestiges* in polite society.

The fierce debate prompted Robert Chambers, the anonymous author of *Vestiges*, to publish an additional 13 heavily revised editions, as well as a sequel called *Explanations*, which incorporating and responding to many the criticisms levelled in the press [20]. This iterative process of production, incorporating what historian Natalie Zemon Davis has called "the creative competence of the lower orders" 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* [27]. A self-styled "Journal of Literature", it was London's most expensive weekly, costing 8d. 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 (Figure 3) had disproven the existence of many nebulae by resolving them into many small stars which had been too difficult to perceive with weaker telescopes. Indeed, the cultural uproar against a materialistic, evolutionary universe had sparked renewed interest in reproducing 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 creation of the largest telescope that had ever been built, now known as the *Leviathan of Parsonstown*, in Birr, in rural Ireland [28]. Many of the "nebulae" from the Herschell catalogue were reportedly resolved - they were not gaseous and could therefore not undergo the gravitational collapse necessary to produce a new solar system. 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 [28].

The *Atlas* then turns to the bearings of the theory on God, an area where "popular feelings are likely to be most deeply interested". First, where does this theory leave individual acts of God? Second, what does it imply for our "estimate of the Divine character"? 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, the *Atlas* reveals 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 [27]

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" [29]. The *Atlas* review—neither overtly political like the *Examiner*, nor heavy-handed like the *Edinburgh*, but instead 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 a point that was critical to "removing prejudice" against Darwin's ideas: 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" [30].

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 Inquirer*, 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 cultural context of the construction of the Leviathan of Parsonstown (Figure 3). Today, the Leviathan is remembered for extending the observable universe beyond the Milky Way, transforming our perception of the scale of the cosmos [28].

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, indirectly, the trajectory of scientific practice itself.

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