Did Georg Cantor believe that he was God's amanuensis?

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ASgc

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Abstract

Georg Cantor is said to have believed that his mathematical theories were directly communicated to him by God. This idea appears to be based on a series of misquotations and misinterpretations of the surviving records, caused partly by changes in social assumptions between Cantor's day and ours. Cantor was a pious Christian, and in later life depressive and eccentric, but we have no reason to think that he suffered from delusions.

Keywords: Cantor, divine revelation, divine inspiration, transfinite numbers, theology

1   Introduction

It is popularly believed that Georg Cantor regarded his theory of transfinite numbers, or perhaps set theory generally, as having been directly revealed to him by God. Some have suggested that this belief was one symptom of the psychological fragility which led Cantor to spend repeated periods in mental hospitals. But it is not clear that Cantor had any such belief.

The article 'Georg Cantor' in the Wikipedia, nowadays the first source of

ASgc

information for most people including professional academics (accessed on 31 May 2021), states in its second paragraph that 'Cantor … believed the theory [of transfinite numbers] had been communicated to him by God', with a footnote citing an article by Joseph Dauben (2004). Writing in a medical journal, the psychiatrist Sylvia Karasu (2021) uses Cantor as a case-study of a brilliant but delusional mind, saying that Cantor 'asserted that his set theory had been divinely inspired and revealed to him *directly* by God. He was merely a "reporter" or "messenger" or even God's "faithful secretary" ' (Karasu's italics). She sees this belief as one symptom of Cantor's fragile psychological constitution, and cites Dauben (1977 and 1979, 147, 298). The Cantor page on a general-interest website written at a popular level, <www.thefamouspeople.com> (accessed on 1 June 2021), states 'It is said that Cantor was a spiritual personality and believed that God communicated some of his mathematical discoveries to him' (this website gives no references). Other examples could be quoted.

2   St Paul or Seneca

A key source for these statements is Joseph Dauben's 'Georg Cantor and the battle for transfinite set theory' (2004), published online in the inaugural issue of the *Journal of the Association of Christians in the Mathematical Sciences*. Dauben says there that Cantor 'was convinced that the transfinite numbers had come to him as a message from God'. He says that 'Letters (and the testimony of colleagues who knew him) reveal that Cantor believed he was chosen by God to bring the truths of set theory to a wider audience'. Dauben's article is headed with a Latin motto, *Veniet tempus, quo ista quae nunc latent, in lucem dies extrahat et longioris aevi diligentia*, and Dauben refers to this motto when he writes about Cantor's

ASgc

belief that the transfinite numbers had been communicated to him from God. In fact, as he noted in the third motto to his last publication, the *Beitr*[*ä*]*ge* of 1895:

> The time will come when these things which are now hidden from you will be brought into the light.

This is a familiar passage from the Bible, first Corinthians, and reflects Cantor's belief that he was an intermediary serving as the means of revelation.

In Dauben (1977, 107 and footnote 94) and in Dauben (1979, 239) Dauben had explicitly quoted these Latin and English sentences as equivalent, in 1977 giving chapter and verse for the source as 1 Corinthians 4:5, which, in the English of the New English Bible, runs:

> My judge is the Lord. So pass no premature judgement; wait until the Lord comes. *For he will bring to light what darkness hides*, and disclose men's inward motives; then will be the time for each to receive from God such praise as he deserves. (My italics.)

If this were the passage Cantor had in mind when writing his 1895 article, it might be natural to read the motto as a suggestion that God had revealed Cantor's theories to him, and was going to vindicate him ('such praise as he deserves') against his mathematical opponents such as Leopold Kronecker.

However, Dauben's attribution of the Latin quotation to St Paul's first epistle to the Corinthians was mistaken. The *Veniet tempus* … passage comes from the Stoic philosopher Seneca's *Naturales Quaestiones* (described by the Wikipedia as 'an encyclopaedia of the natural world'), Book 7 (On Comets), 25:4, and its implications are quite different from what Dauben suggests. The Loeb translation renders the

ASgc

quotation as 'The time will come when diligent research over long periods will bring to light things which now lie hidden'. The passage is saying that scientific research by human beings is destined to uncover much that was unknown in Seneca's day; there is no suggestion of divine revelation, which one would not expect from Seneca. Indeed, *longioris aevi diligentia* implies that the research will involve long-drawn-out human slogging, whereas divine revelation is commonly thought of as more or less instantaneous.

Dauben's English version, 'The time will come …', would not be satisfactory as a rendering of either Seneca or St Paul. In St Paul's Greek, as in the NEB, what is coming is not 'a time' but 'the Lord'. And where Dauben has 'will be brought' as an agentless passive, Seneca specified what was going to reveal the hidden things: the subject of Seneca's *extrahat*, 'will bring out', is *dies … et longioris aevi diligentia*. (*Extrahat* is singular to agree with *dies*, because the *et …* phrase is deferred to the end of the sentence.)

Dauben tells me that he now accepts that the quotation comes from Seneca rather than the Bible. He attributes it correctly in Dauben (2021, 313), though without changing his English rendering.

3   A reporter and a Platonist

So Cantor's Latin motto gives us no grounds for believing that he held set theory or transfinite numbers to be divine revelations. But we saw above that Dauben also referred to 'Letters (and the testimony of colleagues who knew [Cantor])'. In his 1977 article Dauben was specific, saying:

By the early part of 1884, [Cantor] could write to [Gösta] Mittag-Leffler

ASgc

[founder of the journal *Acta Mathematica*] that he was not the creator of his new work, but merely a reporter. *God* had provided the inspiration, leaving Cantor responsible only for the way in which his articles were written, for their style and organization, but not for their content. (Dauben's italics.)

And again:

Cantor also believed in the absolute truth of his set theory because it had been revealed to him, as he once told Mittag-Leffler, from God directly.

These two passages are footnoted with citations of letters from Cantor to Mittag-Leffler of 23 December 1883 and 31 January 1884 'in Schoenflies (1927), 15–16'. Dauben gives the same citations when he repeats the first of these two passages in *Georg Cantor: his mathematics and philosophy of the infinite*, and expands on it (pages 146–7) by writing:

Cantor believed in the absolute truth of his set theory because it had been *revealed* to him. Thus he may have seen himself not only as God's messenger, accurately recording, reporting, and transmitting the newly revealed theory of the transfinite numbers but as God's ambassador as well (Dauben's italics).

With respect to the 23 December 1883 letter, Dauben's citation seems to be mistaken. In Dauben (1979, 332, note 49) he gives a different page-reference for Schoenflies's reference to this letter, saying 'See Schoenflies (1927, 3)'; but I can find no mention of the letter at either of those places, or anywhere else in the Schoenflies article. I shall deal further with the 23 December 1883 letter in section 4 below.

ASgc

Schoenflies (1927, 15–16) does reproduce a passage from Cantor's 31 January 1884 letter to Mittag-Leffler which relates to Dauben's remarks. (Here and below, when I quote directly from German-language documents the translations will be mine; I thank Harriet Pahl for advice on a point of German usage.) The passage runs:

> I am always glad when you praise my stylistic art and economy of exposition, because I certainly put some effort into these aspects, and if this is successful, it is my own achievement; for the rest, that is not my contribution, with respect to the content of my works I am only a reporter and civil servant [*Berichterstatter und Beamter*].

Like many mathematicians, Cantor was a Platonist who believed that the abstractions of mathematics were in some sense real things, independent of the mind of the individual mathematician. As Herbert Meschkowski (1967, 112) put it, 'Cantor is perhaps one of the last, but certainly one of the most important representatives of Plato-oriented thought'. Abraham Fraenkel (1930, 223) summarized Cantor's attitude as 'the mathematician does not *invent* the objects of his science, he *discovers* them' (Fraenkel's italics). The natural interpretation of the remark displayed above is as a modest statement, picturesquely expressed, that Cantor can take no credit for mathematical reality, since that is what it is independently of Cantor, but he is happy to take credit for the felicitous way he has expounded that reality. If the passage were taken as implying that his theories had been directly communicated to him by God, then one would need, absurdly, to attribute a similar belief to every natural scientist who formulates a new physical law or identifies a novel physical entity such as the electron – since (if the scientist's idea is correct) such things are unquestionably part of independent reality rather than the scientist's inventions.

ASgc

4   'A tool of a higher power'

On page 232 of *Georg Cantor* (1979) Dauben repeats the wording of the second and third passages displayed in section 3 above, on this occasion with a footnote to letters from Cantor to Mittag-Leffler of 23 December 1883 and 31 January 1884 as held in the archive of the Institut Mittag-Leffler at Djursholm, a suburb of Stockholm.   And he further writes, pages 238–9, 'Cantor saw his own role, as mathematician, in terms of a faithful secretary, receiving and describing what had been revealed to him by God. … Cantor was merely the intermediary through whom these great, immutable truths had been communicated', again citing those two letters. Finally, he writes, page 298, '[Cantor] believed that set theory, having been divinely inspired from God, was therefore absolutely and necessarily true' (this passage is not footnoted).

I have dealt with the 31 January 1884 letter in section 3 above. Hans Ringström, Deputy Director of the Institut Mittag-Leffler, has been kind enough to supply me with a copy of Cantor's 23 December 1883 letter, and I should like to express my thanks to him and to his Institute. (I am told that the letter has been published in Meschkowski and Nilson (1991, 159–60), a book to which I have no access.) It is perhaps surprising that no part of this letter has been quoted by those arguing for the 'divine amanuensis' idea, since one phrase in it makes a better case for that interpretation than any other writings of Cantor that I have seen. It occurs in the following passage:

> My good friends who rejoice in the name metamathematicians can make what they will of my stuff, they can write what they see fit about it to London and Paris, and to Kamchatka for all I care, but I know that the ideas on which I am working with my weak abilities will be occupying thinking heads for

ASgc

generations, after I and my good friends the metamathematical gentlemen have long since trodden the road that all earthly things must travel. I am far from chalking up my discoveries to my personal merit, for I am only a tool of a higher power [*ein Werkzeug einer höheren Macht*], which will continue to operate after I am gone, just as it revealed itself millennia ago in Euclid and Archmedes.

Out of context, 'I am only a tool of a higher power' might perhaps suggest (though would still surely fall short of) the kind of assertion about direct divine communication discussed in section 1. But it is important that this remark follows a passage which, whether or not it was factually justified, was certainly very boastful. Social attitudes to 'blowing one's own trumpet' vary from age to age. British academics have been forced to become more boastful during my working lifetime by a new régime of financial competition between universities, but even now I believe few of our profession would be willing to phrase positive evaluation of their own work as bluntly as this without softening the remarks with some expression of modesty. Fifty or sixty years ago in Britain, and (I surmise) in 1880s Germany, leaving such remarks unsoftened would have seemed quite intolerable.

But it was very easy for Cantor to say (with sincerity) what he needed to say, since he was a believing Christian who took his religion seriously – which is no surprise considering that he came from a notably pious family background (see for instance his father's letter of Whitsun 1860 published in Fraenkel 1930, 191). It is a standard Christian trope that anything good we do represents God working through us; a pious Christian regards God as a partner in all his actions. Many Christians know a prayer attributed to the sixteenth-century St Teresa of Ávila, containing the words (in one English version) 'Christ has no body now on earth but yours; no hands but yours; no feet but yours'. Perhaps some will feel that remarks such as those quoted in section 1

ASgc

are saying no more than that Cantor acknowledged God as his collaborator in this sense. But then Cantor would merely be saying of himself what he would have thought equally true of anyone doing any kind of good work (though it was about himself alone that modesty required him to make the point explicit). A present-day claim such as that Cantor 'asserted that his set theory had been … revealed to him *directly* by God' says that Cantor saw his case as much more special than that. But his quoted wording does not bear such an interpretation.

If Cantor's letter were intended to claim that sort of 'special relationship' with God, then logically it would also imply that the pre-Christian mathematicians Euclid and Archimedes had similar special relationships. But no-one could know that unless Euclid and Archimedes had said so. All Cantor was saying was that their achievements were so great as to make very obvious the collaboration from a higher power which, as a religious man, he saw as a feature of all good work. Indeed, in this passage Cantor did not even personalize the 'higher power'; he refers to it as *sie*, the feminine pronoun to agree with *höhere Macht* (hence 'it' in my translation), whereas if that phrase were intended to stand transparently for God as a person, who might have spoken to Cantor, one would expect the masculine pronoun *Er*, 'He'.

Dauben also (1979, 147) quotes Cantor as writing, in an 1888 letter to the Franciscan theologian Ignatius Jeiler (published in Bendiek 1965, which I have not seen): 'I entertain no doubts as to the truth of the transfinites, which I have recognized with God's help'. For a religious man, to acknowledge God's help in achieving a success is even more routine when corresponding with a cleric than it might be in other circumstances.

The atmosphere of academic life in the 21st century, in the English-speaking world at least, has become so unprecedentedly secular that expression of even conventional religious beliefs in the context of academic research is perhaps enough for

ASgc

readers to attribute to the researcher delusional ideas about hotlines to the Almighty. If so, that would tell us more about 21st-century thought than about Cantor's.

5   The danger of heresy

Not only was a religious outlook relatively unremarkable for a nineteenth-century academic, but Cantor's research topic had inherent religious resonance. Cantor was well aware that pinning the infinite down with formal mathematical theorems could be seen as a suspect activity from a religious point of view, since traditionally the infinite was regarded as God's domain and human beings could have dealings only with the finite. Dauben describes this view accurately as 'The infinite, or Absolute … belonged uniquely to God. Uniquely predicated, it was also beyond determination'; he refers to 'the challenge of mathematical infinity to the unique, absolute infinity of God's existence' (Dauben 1979, 123, footnote omitted; 143). Cantor (1887–8, 385–7) tells us that a clerical correspondent (not named by Cantor, but identified by Fraenkel, 1930, 227, as the Jesuit Cardinal Franzelin) warned him that his theory of the transfinite risked committing heresy. Cantor defended his theory against this imputation, but never (so far as I have seen) by saying that he had had the theory directly from God Himself (though that could have seemed a strong defence, if Cantor had believed it).

Meschkowski (1965) reproduced the text of long letters by Cantor to Thomas Esser, a Dominican professor of canon law, dated 1 and 15 February 1896, which discuss relationships between Cantor's work and theological matters. Cantor makes clear that he sees his research into the transfinite as helping us to better understand the nature of God, and, after explaining that he had hoped to find connexions with his work in the writings of various seventeenth-century figures who discussed the infinite (but failed to find such links), Cantor even remarks 'The beginnings of the true theory of the

ASgc

infinite have been presented to Christian philosophy for the first time by me'. But this does not say that the theory was given to Cantor by Someone else – it rather emphasizes that the theory was his own work.

To deny that Cantor thought God had directly revealed his mathematical theories to him is not to deny that for Cantor there were strong links between his mathematics and issues of theology. Such links have been ably discussed by others, not least by Joseph Dauben. I am concerned in this paper only with the 'divine amanuensis' claim, and have nothing to add to the existing literature on that wider topic.

6   'Careful and exact mathematical investigations'

Another scholar who had discussed links between Cantor's theological views and his mathematics is Michael Hallett. Hallett (1984, ch. 1) quotes from a letter of Cantor's dated 21 May 1886 to Eberhard Illigens: 'If I have recognized the inner consistency of a concept which points to a being, then *the idea of God's omnipotence impels me* to think of the being expressed by the concept as in some way actually realizable' (my italics). Perhaps someone might suggest that this amounts to Cantor saying that his belief in the reality of transfinite numbers was dictated by God. But not really: the 'idea of God's omnipotence' might 'impel' a believer, say, to see himself as worthless, but that would not be the same as God announcing that the believer is worthless.

Other Cantor quotations in Hallett's chapter describe Cantor's own role in formulating his theories as much more than a 'messenger' or 'faithful secretary'. From Cantor (1883, 573) Hallett quotes:

> Likewise it is my conviction that one cannot attempt to gain knowledge of the continuum by starting with the so-called *form of spatial intuition*

ASgc

[*Anschauungsform des Raumes*], since space and the structure attributed to it achieve that substance by which they can become the object not merely of aesthetic reflections or philosophical scrutiny or imprecise comparisons, but of careful and exact mathematical investigations, *only* with the help of a continuum conceptually fashioned and already available (Cantor's italics; Hallett's italicization removed)

– which Hallett glosses by writing 'mathematics and natural science must be based very largely on conceptual frameworks *provided by us not simply dictated by Nature*, though, as Cantor says, Nature may "stimulate" us' (my italics). And from page 589, note 6 of the same article Hallett quotes:

[certain knowledge] can only be obtained through concepts and ideas [*Ideen*], which are at best only stimulated by outer experience, but which are principally formed through inner induction and deduction, like something which, so to speak, already lay within us and is only awakened and brought to consciousness.

Cantor's phrase 'careful and exact mathematical investigations' describes active human intellectual work, not secretarial recording of divine revelations. 'Induction and deduction' are active operations within the mind of the human mathematician, which go beyond what would be required of a passive amanuensis to God.

Joseph Dauben (personal communication) defends his 'divine amanuensis' idea by drawing my attention to an 'explicit statement' in a letter by Cantor to the theologian K F Heman of 21 June 1888, quoted in the closing pages of Dauben (1979):

My theory stands firm as a rock; every arrow directed against it will return

ASgc

quickly to its archer. How do I know this? Because I have studied it from all sides for many years; because I have examined all objections which have ever been made against the infinite numbers; and above all, because I have followed its roots, so to speak, to the first infallible cause of all created things.

This is certainly explicit about the fact that Cantor saw his mathematical theory as related to theological ideas, but I see no assertion in this passage that he obtained that theory through direct revelation by God.

7   Freedom to err

I would even see divine revelation as inconsistent with Cantor's idea of mathematics as a discipline. Defending his controversial treatment of infinities as actual numbers, Cantor (1883, 563–4) insisted that mathematicians are entirely free to postulate new mathematical entities, subject only to the need to avoid contradictions and to define clearly the relationships between new entities and those already established. As in natural science, some novel mathematical theories will prove to be misguided, and with time they will be winnowed away. Cantor would have preferred to call pure mathematics 'free mathematics', and said 'the *essence* of *mathematics* lies precisely in its *freedom*' (Cantor's italics). Fraenkel (1930, 224) saw a tension between Cantor's Platonism and his emphasis on the freedom of mathematical research, but it is unquestionable that intellectual freedom for the mathematician was a key value for Cantor, and freedom is not an idea we associate with the work of a messenger or a secretary.

8   Conclusion

ASgc

Joseph Dauben brings out clearly (for instance 1977, 105ff.; 1979, 159–60) how from about 1884 onwards Cantor felt that the mathematical community was so hostile to him and his ideas that he preferred to move away from mathematical publication towards philosophy and theology (though Grattan-Guinness, 1971, 350, offers a note of caution about this aspect of Cantor's biography). In his later life Cantor developed eccentric ideas about topics not connected to mathematics – a notable instance being his claim, in a letter of 10 November 1899 to Count von Posadowsky-Wehner at the Prussian Ministry of the Interior seeking non-academic State employment (published in Grattan-Guinness 1971, 378–9), to have discovered historical facts about 'the first kings of Great Britain' which if published would induce 'salutary terror' among the British government. Cantor was evidently hoping to curry favour by offering his government a potential weapon in its diplomatic jostling with a rival Great Power, but he was to say the least remarkably naive to think that any finding about mediaeval history could have current value in that context.

(Here I assume that Cantor's 'kings of Great Britain' was a foreigner's vague way of referring to the kings of England. If 'first kings of Great Britain' was intended precisely, as a reference to the eighteenth-century Hanoverians, then any finding which raised a doubt about their line of succession would indeed have created a constitutional issue – and, if there were anything of the sort to be discovered, Germany would be a likely place to find it. So I suppose it is just possible that even this remark of Cantor's could have been less crazy than it looks.)

Nevertheless, Cantor did grow eccentric in later life; and, as already said, he was a Christian who took his religion seriously. But the Cantor quotations which have been cited in support of the 'divine amanuensis' idea contain nothing that might not have been written by an ordinary level-headed, conventional Christian. This is not to say that

ASgc

Cantor's own religious position was conventional – it was certainly not, but that is a separate, large issue that will not be gone into here. However, I know of no evidence that Cantor came to believe that his theories had been directly revealed to him by God. At present, people's willingness to accept that idea seems to be running far ahead of any support for it that we have been shown to date. Sylvia Karasu herself quotes Grattan-Guinness's remark that 'The "popular" account of [Cantor's] life is richer in falsehood and distortion than in factual content'. The story that he believed he had his mathematical theories straight from the lips of God seems to be a case in point.

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ASgc

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ASgc

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ASgc