Reference Lists and Citations in the Mathematical Reviews Database

Mathematicians have long been accustomed to studying a given area of mathematics by using the reference list in a paper of interest to go from that paper to related papers, and then to papers in the reference lists of those related papers, and so on, thereby navigating back through the antecedents of a particular topic or result. The new release of MathSciNet in fall 2001 contains a major enhancement to the underlying Mathematical Reviews (MR) Database that builds on this idea: in the MathSciNet entry for a paper the inclusion of the *full* reference list from the original paper with links from the references to reviews. The addition of linked reference lists also enables *forward* citations in MathSciNet: for each item, links to (MathSciNet entries for) papers in which the given item is cited in the reference list.

This kind of navigation, which has in the past been done in the library by going from a paper in one journal to a related paper in another journal, is now possible in MathSciNet: locate an item of potential interest (and use the review to help decide whether it really is of interest); scan the reference list of the item, which follows the review on MathSciNet, to locate a reference of particular interest; click on the link in the reference to reach the MathSciNet entry for it; once again, investigate whether the item is of interest by reading the review; and so on. For an increasing number of items in MathSciNet there are not only links internal to MathSciNet but also a link to the original paper; such links greatly enhance the kind of navigation through MathSciNet enabled by linked references. The AMS is committed to expanding the number of links from MathSciNet entries to the original article or book online, so that researchers will increasingly be able to search back through MathSciNet and thence right to the original documents of interest, all from the desktop.

Citation indexing is familiar to all scientists, and MathSciNet users have often asked whether it is possible to include this feature in MathSciNet. The forward reference citations that are now listed for each entry provide a start to full citation indexing by providing a (partial) list of articles and books in which the item is cited. Just as the reference lists themselves can be used to trace mathematical ideas back through the literature, so the reference citations given for each MathSciNet item can be used to trace the development of mathematical ideas forward through the literature. It is also possible on MathSciNet to search for a given author name in the reference lists and thus find where books and papers (including preprints and other items not in the MR Database) by that author appear in the reference lists on MathSciNet.

The kind of backward and forward navigation that linked references make possible is not new in MathSciNet. Since its inception in 1940, MR has included references in reviews. Review references that have an MR entry are identified by the corresponding MR number. In MathSciNet the review reference is directly linked via the MR identifier to the full MathSciNet entry. The MR identifiers of references in reviews have also been used in MathSciNet to provide forward links: for each item, there is a list of those reviews that cite the item, "review citations". However, the number of review references has intentionally been limited (less than two per review on average), and some reviews contain no references at all. The addition of full reference lists vastly increases the number of links among related items on MathSciNet.

The project of gathering and adding reference lists (together with the links, generated by a sophisticated matching algorithm) to the MR Database began in early 2001. Initially, lists from sixty-five journals are being added, for published issues from 2000 on. New issues of these journals are treated on receipt at the MR office on an ongoing basis. Later, other journals and possibly earlier time periods also will be covered. Thus, the numbers of both the MR Database items with full reference lists and the corresponding forward citations will grow over time, making MathSciNet an increasingly powerful tool with which to explore the interconnections among the literature.

The addition of reference lists and the associated forward citations represent the most significant change in the structure and content of the MR Database in the over sixty years since it was founded. The enhanced MathSciNet is undoubtedly an indispensable adjunct to the mathematical literature.

—Jane Kister
Executive Editor
Mathematical Reviews

Letters to the Editor

The Longest Waiting Time for Print in Modern Mathematics

Hala Pflugfelder is well familiar with the history of loop theory since the 1920s when it began, as evidenced (i) from her books that significantly contributed to the history of loop theory [*Quasigroups and Loops: Theory and Applications*, edited with O. Chein and J. D. H. Smith, Heldermann Verlag, Berlin, 1990; and *Quasigroups and Loops: Introduction*, Heldermann Verlag, Berlin, 1990] and (ii) from the historical notes she presented to the first international conference on loop theory, Prague, July 28–August 1, 1999 [Historical notes on loop theory, *Comment. Math. Univ. Carolin.* **41** (2000), no. 2, 359–370]. I was therefore delighted to read in her review for *Mathematical Reviews* [MR 2000j:20131]:

> In incidence geometry, H. Karzel, also in the 1960s, introduced K-loops as additive systems of his near-domains, with an emphasis not on identities but on special automorphisms. In print, the term "K-loop" appeared only in 1989 in a paper by A. A. Ungar, who was the first to discover that the addition of relativistic velocities is a loop with Thomas gyrations playing the role of special automorphisms. He named this system a complete weakly associative-commutative group(oid), but later switched to his gyro-language.

I realized from Pflugfelder's review that H. Karzel waited 20–30 years for me to bring the term "K-loop" into print! Certainly, this is the longest waiting time for print in the history of loop theory. Unfortunately, however, I could not figure out the exact waiting time of H. Karzel, since it depends on the undisclosed exact time "in the 1960s" when he "introduced K-loops" into some undisclosed media.

As Hala Pflugfelder noted in her review, my introduction of the notion of the K-loop in 1989 (which later became known as the gyrocommutative gyrogroup) enabled, for the first time, loop theory to be applied in physics. Unlike H. Karzel, readers of the *Notices* need not wait 20–30 years for my publication. The story of the K-loop that I introduced in 1989, now known as the "gyrocommutative gyrogroup" that has sprung from the soil of Einstein's special theory of relativity, is told in my recent book: *Beyond the Einstein Addition Law and Its Gyroscopic Thomas Precession: The Theory of Gyrogroups and Gyrovector Spaces* (Kluwer Academic, 2001).

—*Abraham A. Ungar*
North Dakota State University

(Received May 6, 2001)

Segal's Cosmology

I strongly disagree with the suggestion in the article by Daigneault and Sangalli [*Notices*, January 2001, pp. 9–16] that the late Irving Segal's chronometric cosmology (CC) is a viable scientific theory, that Segal "has refuted all published criticism of CC." Readers of the *Notices* would get a better understanding of the status of CC from Segal's obituary by Baez et al. [June/July 1999, pp. 659–668].

My own experience, when I published a critique of CC [*Astrophys. J.* **313** (1987), 551–555], was that Segal's "refutation" missed the point. I examined for $S_1 < S_2$ a ratio $E(S_1, S_2)$ defined as $(S_1/S_2)^{1.5} N(S_1)/N(S_2)$, where $N(S)$ denotes the number of sources per steradian brighter than the flux S. I showed that CC predicts, for any homogeneous distribution of sources and for any fluxes $S_1 < S_2$, that $E(S_1, S_2)$ is bounded above by $3\pi/2$, a bound incompatible with an observed value that exceeds 17. Segal's published reply [*Astrophys. J.* **320** (1987), 135–138] states that I am wrong because $E(S_1, S_2) \to \infty$ as $S_2 \to 0$ with fixed positive S_1. But in this case the inequality $S_1 < S_2$ is violated, so Segal's response is simply irrelevant.

The chronometric cosmology did not fit the data when it was published in 1976, and this disagreement became more extreme as the data on the redshift-magnitude law improved. Riess, Press, and Kirshner [*Astrophys. J.* **473** (1996), 88–109] used data for Type Ia supernovae to show that

$$\log(z) = \text{const} - (0.5025 \pm 0.0088)\log(S),$$

where z is the redshift and S is the observed flux. This result supports the Hubble Law prediction $\log(z) = \text{const} - 0.5\log(S)$, but it cannot be reconciled with the prediction $\log(z) = \text{const} - \log(S)$ of CC. Consequently, it is not surprising that most cosmologists ignored Segal's theory for the last years of his life.

The test of a physical theory is whether its predictions agree with observation. Segal's chronometric cosmology fails the test.

—*Edward L. Wright*
UCLA

(Received June 13, 2001)

Big Bang Cosmology

Greg Kuperberg argues in his February 19, 2001, letter that Segal's theory is useless because it disagrees with Big Bang cosmology. He seems unaware that there is a growing dissident faction of cosmologists who find that the Big Bang theory has been overthrown by observational evidence. The chief proponent of this idea is Halton Arp, whose recent book *Seeing Red* summarizes this evidence. Arp's strongest argument is the observation of high redshift quasars which are physically connected to low redshift galaxies. Pairs of high redshift quasars that are symmetrically arranged to a "foreground" galaxy occur far more often than chance alone would permit, suggesting ejection.

Big Bang cosmology depends on the redshift-distance relationship. If that relationship does not hold, then we may not live in an expanding universe after all. Theoretical cosmology should keep an open mind.

—*Rochus Boerner*
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Revolutionary Dirk Struik

In 1951, I was a junior at M.I.T. and was fortunate to be enrolled in the differential geometry class taught by Dirk Struik. It was around the time that he was indicted by the Commonwealth of Massachusetts for various allegedly subversive activities, but in class he did not seem to be under any strain and maintained his good humor through it all. When we got to the portion of the course that was about surfaces of revolution, he said to us, absolutely deadpan, that he was going to call them "surfaces of rotation", because his perilous legal position vis-à-vis the state would not allow him any more to utter the word "revolution".

—Herbert S. Wilf
University of Pennsylvania

(Received July 3, 2001)

Prizes

Andy Magid makes a good case for increased and improved prize giving. Would it also be better to have more Fields Medals, perhaps two every year so that the number will match what goes on with Nobels? We could greatly improve publicity by having the announcement of the winners and the giving of the prizes at two separate times, with two chances for publicity, and that is twice every year. The public relations work on prizes in mathematics, in general, is primitive by comparison with other areas.

Of course, mathematics—and, in particular, very much so pure mathematics—is quite different from all other disciplines in that evaluations usually agree and secondary ratings like prizes are not needed. There are not many conflicts about methods, just a concentration on results in evaluations. We don't need prize givers to tell us who is doing great things!

And, also, prizes can have negative effects, as strange as this seems (and not just the consequences of the many unfair ways things are awarded). I was on a committee in my university years ago, screening nominations for honorary degrees, and the math department had submitted one for a Fields Medalist. The university policy of trying to honor people who have yet to receive significant honors was brought up as possible grounds for turning down the recommendation, but I saved the day by pointing out that Fields Medalists, as compared to Nobelists, received neither fame nor money.

This suggests also a nice tactic in departmental politics of downgrading a suggested appointment because the case is full of mention of prizes, all of secondary interest! That would be ironic.

—Jon Alperin
University of Chicago

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Correction

Due to a typographical error, David George Crighton's first name was incorrect on the cover of the September 2001 *Notices*.

About the Cover

The cover image shows the San Diego skyline, San Diego, California. San Diego is the site of the 2002 Joint Mathematics Meetings, January 6-9, 2002.

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