

# Northumbria Research Link

Citation: Heather, Michael and Rossiter, Nick (2008) Don't confuse left and right exactness! A note correcting the distinction in the Proceedings of ANPA 27. In: Exactness : proceedings of ANPA 29. ANPA, Cambridge, pp. 157-159.

Published by: ANPA

URL:

This version was downloaded from Northumbria Research Link:  
<http://nrl.northumbria.ac.uk/1711/>

Northumbria University has developed Northumbria Research Link (NRL) to enable users to access the University's research output. Copyright © and moral rights for items on NRL are retained by the individual author(s) and/or other copyright owners. Single copies of full items can be reproduced, displayed or performed, and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided the authors, title and full bibliographic details are given, as well as a hyperlink and/or URL to the original metadata page. The content must not be changed in any way. Full items must not be sold commercially in any format or medium without formal permission of the copyright holder. The full policy is available online: <http://nrl.northumbria.ac.uk/policies.html>

This document may differ from the final, published version of the research and has been made available online in accordance with publisher policies. To read and/or cite from the published version of the research, please visit the publisher's website (a subscription may be required.)

[www.northumbria.ac.uk/nrl](http://www.northumbria.ac.uk/nrl)



# Northumbria Research Link

University Library, Sandyford Road, Newcastle-upon-Tyne, NE1 8ST

# Don't Confuse Left and Right Exactness!

## A Note correcting the Distinction in the Proceedings of ANPA 27

M. A. HEATHER & B. N. ROSSITER  
Northumbria University, Newcastle NE2 1XE, UK,  
michael.heather@cantab.net; nick.rossiter@unn.ac.uk  
<http://www.computing.unn.ac.uk/staff/CGNR1/>

### Abstract

A note correcting and enlarging on the distinction between the parities of exactness and adjointness in our paper *Process as a World Transaction* in the proceedings of ANPA 27.

## 1 Background

At ANPA 27 we went through the details for the withdrawal of cash from an Automated Teller Machine as a database transaction that could not be perfectly achieved with present computers based on the von Neumann architecture. Category theory is able to show the difference between physical process and its formal representation using classical mathematical models. However in the published version of the written paper [3] the distinction between left/right adjointness and left/right exactness is not properly distinguished in our Concluding Summary of the paper in section 10 at page 153-154. The corrected version of this *Concluding Summary* is reproduced below. We have also taken the opportunity to replace the Figure 20 with a more recent improved version that makes patent the covariant/contravariant distinction between the two triangles in the left and right categories.

The diagram in Figure 20 employs the possible uses of left and right to be found in categorial descriptions. Confusion can arise from thinking in terms of labels left and right. The concepts themselves are always quite distinct. In our ANPA 27 paper the final concluding summary became too compressed. The correct version of section 10 is shown below, with appropriate changes made to item 1.

## 10. Concluding Summary

Because adjointness is everywhere and the discussion has been wide-ranging we should perhaps conclude with a summary of the main theme of this paper of transaction in information systems as process. The main steps are:

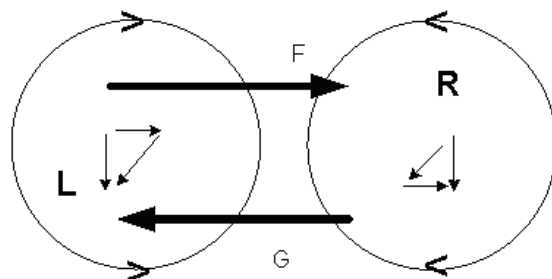


Figure 20. Adjointness between Two Systems

1. An information system has a left adjoint  $F$  i.e. right co-exact (physically represented) process which is uniquely co-ordinated by adjointness with a right adjoint  $G$ , left co-exact, underlying logical process  $F \dashv G$  as in the figure in Figure 3 reproduced here as Figure 20 [2, 1].
2. An ATM banking transaction where the left-hand triangle composes with delivery of cash simultaneously debited from the customer's account lacks a left-adjoint functor  $F \dashv G$  in a

universal Turing machine and therefore on any electronic digital computer with a von Neumann architecture. However a true quantum computer would not be so restricted.

3. Commercial practice seeks to model the adjointness with a sequential process that adheres to the principle of ACID.
4. The ACID principles which evolve out of good commercial practice can themselves be shown to adhere to a deconstructed monad, a triple over adjointness, as independently developed by category theorists.

## References

- [1] Freyd, P, *Abelian Categories, an Introduction to the Theory of Functors*, Harper & Row, New York (1964).
- [2] Freyd, P, & Scedrov, A, *Categories, Allegories*, North-Holland (1990).
- [3] Rossiter, B N, Heather, M A, & Sisiaridis, D, Process as a World Transaction, *Proceedings ANPA 27 Conceptions* 122-157 (2006).