Book reviews

Roland Bechmann, Villard de Honnecourt: La pensée technique au XIIe siècle et sa communication. By A. G. Keller

R. W. Hadden, On the Shoulders of Merchants: Exchange and the Mathematical Conception of Nature in Early Modern Europe. By Serafina Cuomo

Bruce Stephenson, The Music of the Heavens: Kepler's Harmonic Astronomy. By J. Bruce Brackenridge

William Eamon, Science and the Secrets of Nature: Books of Secrets in Medieval and Early Modern Culture. By Penelope Gouk

Margaret J. Osler, Divine Will and the Mechanical Philosophy: Gassendi and Descartes on Contingency and Necessity in the Created World. By John Henry

Piyo Rattansi and Antonio Clericuzio (eds.),Alchemy and Chemistry in the 16th and 17th Centuries. By Sarah McNaught

Mark Greengrass, Michael Leslie and Timothy Raylor (eds.), Samuel Hartlib and Universal Reformation: Studies in Intellectual Communication. By Michael Hunter

Michael Hunter (ed.), Robert Boyle Reconsidered. By Scott Mandelbrote

R. E. R. Banks, B. Elliott, J. G. Hawkes, D. King-Hele and G. L. Lucas (eds.), Sir Joseph Banks: A Global Perspective. By Brian P. Dolan

John Gascoigne, Joseph Banks and the Enlightenment: Useful Knowledge and Polite Culture. By Brian P. Dolan

David Elliston Allen, The Naturalist in Britain: A Social History. By Charles W. J. Withers

Gavin Bridson, The History of Natural History: An Annotated Bibliography. By Janet Browne

Nicolaas A. Rupke, Richard Owen, Victorian Naturalist. By Mario A. Di Gregorio

Frederick Burkhart, Duncan M. Porter, Joy Harvey and Marsha Richmond (eds.), The Correspondence of Charles Darwin. Volume 9, 1861. By Michael Shortland

Martin J. Klein, A. J. Kox, Juergen Renn and Robert Schulmann (eds.), The Collected Papers of Albert Einstein. Volume 3: The Swiss Years: Writings, 1909–1911. By Andrew Warwick

Martin J. Klein, A. J. Kox, Juergen Renn and Robert Schulmann (eds.), The Collected Papers of Albert Einstein, Volume 3: The Swiss Years: Writings, 1909–1911. English translation by Anna Beck and Don Howard. By Andrew Warwick

Klaus Hentschel, Interpretationen und Fehlinterpretationen der speziellen und der allgemeinen Relativitätstheorie durch Zeitgenossen Albert Einsteins. By Richard Staley

Fernando Vidal, Piaget Before Piaget. By Martin Kusch

Christopher Lawrence, Medicine in the Making of Modern Britain, 1700–1920. By John V. Pickstone

W. F. Bynum, Science and the Practice of Medicine in the Nineteenth Century. By Malcolm Nicolson

Kenneth J. Carpenter, Protein and Energy: A Study of Changing Ideas in Nutrition. By David Smith

Charles J. Smith, Edinburgh's Contribution to Medical Microbiology, edited by J. G. Collee. By Noel G. Coley

Alfred I. Tauber, The Immune Self: Theory or Metaphor? By Mark Jackson
Roland Bechmann, Villard de Honnecourt: La pensée technique au XIIIe siècle et sa communication. Paris: Picard, 1991. Pp. 383, ISBN 2-7084-0367-2. 420 FF.

The great churches of the High Middle Ages were the most ambitious artefacts which had until then been put together by human skill. In terms of the volumes enclosed, the heights and relative thicknesses of the walls, whose area was further reduced by extensive windows, none could rival them. The interiors are complicated by sub-spaces—aisles, triforiums, side-chapels and so on—but despite their ornate carving, like other buildings they had to be constructed according to simple geometrical principles.

Clearly, the knowledge used to design and construct these remarkable Gothic structures was considerable, but was in the main transmitted orally, within a circle of highly skilled men, who intended to keep their trade secrets—the source of their income and their status—as far as possible to themselves. Just one precious handbook of bright ideas has come down to us from a thirteenth-century architect; the Carnet of Villard de Honnecourt. As the engineering achievement of Gothic cathedrals has been so admired and studied, it is not surprising that this little book, hardly more than a collection of small sketches and brief notes, has for well over a century attracted monographs and several editions. Roland Bechmann as an architect himself as well as an enthusiast for medieval culture is well qualified to bring a fresh view to Villard. He is familiar with the building trade and knows something of the traditions of the 'compagnonnage', those semi-secret associations of masons and other workers in stone and wood, which apparently survived until quite recently.

In fact Villard's book is very much a collection of tricks of the trade. Ingenious dodges may share a page with aesthetic solutions to architectural problems. Perhaps then Villard (about whom we know nothing but the little revealed in the notes to his drawings), was not quite an insider. Some of these matters he would have observed; others he might have thought out for himself. One of the most interesting aspects of the book is the light it throws on the transmission of geometrical methods as techniques. For, if Villard himself may have read Euclid or contemporary textbooks of applied geometry, most masons had not. They would have learnt what geometry they needed, on the job. Equipped only with a builder's level, maybe a pair of dividers, plumb-bob, a rule, some pegs and cord, they had to form circles, arcs intersecting curves, recesses, the ribs of their vaults, the cylinders of their columns.

Bechmann takes us carefully through a few pages crammed with thumbnail sketches, showing how each refers to a particular technique for producing regular forms in various situations. This section has attracted less attention than the drawings of machines, mostly concerned with building work: jacks to prop up overhanging oriel, a water-powered saw, another saw to cut off the ends of piles under water. Some belong to other occupations; there is a trebuchet and a curious crossbow, which Bechmann shows is probably a trap.

Sometimes his enthusiasm may make him rather disingenuous, as when he defends Villard against the charge of believing he could design a perpetual motion; or when he claims that Villard may have left out some part of his machine drawing because that component was not visible, and Villard could only draw what he had seen. Given that two or more viewpoints may be used in a single sketch, some are indeed not easy to interpret.

Also hard to explain are those pages which show humans in a variety of poses, and some animals, all drawn around triangles, rectangles, regular curves, usually in some combination (among the beasts are a pair of birds which Bechmann calls flamingoes; but would they have been known in Northern France in the thirteenth century?). Bechmann criticizes previous explanations of these curious images, for he maintains that they are mnemonic in purpose. To masons...
for whom Euclid was a closed book, but who had learnt a number of particular theorems and their consequences in application, these symbolic figures would call to mind the diagrams of particular granules of geometrical knowledge. Even if, as Beckmann admits, his solution must often be tentative, he expounds each of these drawings in detail. For him, however, this does not discount the possibility that many of these figures might have had some more profound, hidden meaning for the master of the builders' mystery.

All in all, then, even if the Carnet retains much of its difficulty, this will be a classic effort to elucidate all its problems and tie them to the practice and the mental environment of the medieval builders. No one in future who looks into the study of Gothic structures will fail to consult this exhaustive study of a rare peephole into their methods.

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R. W. HADDEN, On the Shoulders of Merchants: Exchange and the Mathematical Conception of Nature in Early Modern Europe. Albany: State University of New York, 1994. Pp. xviii + 191. ISBN 0-7914-2011-6. $14.95.

"Money" expresses for commerce what "general magnitude" does for the mathematics of calculation with bodies. From the twelfth to the sixteenth centuries growing relations of exchange resulted in the sedentary merchant, whose professional ally, the master reckoner/mathematical practitioner [sic], developed the theoretical concept of general magnitude (pp. 160–1). This interesting claim more or less summarizes Richard Hadden’s book: a revision of E. Zilsel’s and F. Borkenau’s theses, according to which the rise of ‘modern’ scientific knowledge was closely connected to that of new commercial and industrial structures. More specifically, new forms of exchange (commodification of goods and alienation of the producer from the product) correspond not only to new ways of doing practical mathematics, but to new mathematical notions.

People like the abacus teachers, who constituted a mathematical tradition alternative to the ‘official’ one, modified the classical concepts of number and magnitude (as described in J. Klein’s Greek Mathematical Thought and the Origin of Algebra). They devised a unified proportion theory that permitted relations between non-homogeneous magnitudes and between geometrical magnitudes and numbers, thus establishing a more general notion of mathematical magnitude. Moreover, it allowed the application of mathematics to the physical world, which thus became quantified, deprived of its ‘qualitative’ aspects and, in a way, mechanized. The transformation of the world-picture carried out in mechanics/applied mathematics paralleled and mirrored the reification of labour and of exchange. The notion of ‘value’, abstracted from its real production-situation, went along with that of (material) ‘body’, abstracted from its individual characteristics.

The fact that ‘science’ has to do with ‘money’ or ‘power’ is justified, somewhat redundantly, by Hadden’s paraphrase of Marxian theories in chapter 2 – to the effect that ‘things do rule people’ (p. 160). Of course, the author realizes that very few causal connections, especially of the historical kind, are so clear-cut. Indeed, he reviews the sociological literature on the subject (including Barnes, Freudenthal, Laudan, Merton) and points out the problems it raises: how to select some factors as agents of change, how then to interpret historical phenomena using a privileged set of causes, what is the nature itself of sociological accounts of historical phenomena.

Those are, I think, the main problems with Hadden’s book, too. Even though his basic tenet, in itself perhaps slightly reductive, sounds convincing, the arguments of the book leave its validity pretty much undecided from a historical point of view. This could be due to Hadden’s apparently limited use of the primary sources. He points out that practically all the mathematical practitioners to whom the ‘Scientific Revolution’ is ascribed (from Bradwardine to Dee, from Tartaglia to Stevin) had some connection, personal or otherwise, with commerce and money matters – which works well in some cases and less well in others. For instance,