valence bond angles in X-ray structures of ribonucleos(t)ide derivatives (Westhof & Sundaralingam, 1980) and from geometrical constraints due to ring closure. Hence, for the title compound discrepancies between experimental and calculated bond lengths might be expected in view of the observed differences between the bond angles centred on C(2) and C(3). Indeed, a comparison between experimental and calculated bond lengths shows differences for C(1)–O(4) ($L_{obs} - L_{calc} = 0{\cdot}04$ Å) and C(2)–C(3) ($L_{obs} - L_{calc} = -0{\cdot}04$ Å). Remarkably, the mean endocyclic bond lengths of the acetylated β-D-riboses accord well with the corresponding calculated values. These observations demonstrate again the important influence of the substituent at C(1) on the conformation of the five-membered ring.

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References

ALTONA, C. (1964). PhD Thesis, Univ. of Leiden.

ALTONA, C., GEISE, H. J. & ROMERS, C. (1968). *Tetrahedron*, **24**, 13-32.

ALTONA, C. & SUNDARALINGAM, M. (1972). *J. Am. Chem. Soc.* **94**, 8205-8212.

BEALE, J. P., STEPHENSON, N. C. & STEVENS, J. D. (1971). *Chem. Commun.* p. 25.

BEURSKENS, P. T., BOSMAN, W. P., DOESBURG, H. M., GOULD, R. O., VAN DEN HARK, TH. E. M., PRICK, P. A. J., NOORDIK, J. H., BEURSKENS, G., PARTHASARATHI, V., BRUINS SLOT, H. J. & HALTIWANGER, R. C. (1984). *DIRDIF.* Tech. Rep. 1984/1. Crystallography Laboratory, Univ. of Nijmegen.

BRUINS SLOT, H. J. & BEURSKENS, P. T. (1987*a*). In preparation.

BRUINS SLOT, H. J. & BEURSKENS, P. T. (1987*b*). In preparation.

CZUGLER, M., KÁLMÁN, A., KOVÁKS, J. & PINTÉR, I. (1981). *Acta Cryst.* B**37**, 172-177.

EGERT, E. (1984). 13th Int. Congr. Crystallogr., Hamburg, Collected Abstracts, p. C481.

GRANT, D. F. & GABE, E. J. (1978). *J. Appl. Cryst.* **11**, 114-120.

International Tables for X-ray Crystallography (1974). Vol. IV. Birmingham: Kynoch Press. (Present distributor D. Reidel, Dordrecht.)

JAMES, V. J. & STEVENS, J. D. (1973). *Cryst. Struct. Commun.* **2**, 609-612.

JEFFREY, G. A., POPLE, J. A., BINKLEY, J. S. & VISHVESHWARA, S. (1978). *J. Am. Chem. Soc.* **100**, 373-378.

JEFFREY, G. A. & YATES, J. H. (1980). *Carbohydr. Res.* **79**, 155-163.

JOHNSON, C. K. (1965). *ORTEP.* Report ORNL-3794. Oak Ridge National Laboratory, Tennessee.

LEEUW, F. A. A. M. DE, VAN KAMPEN, P. N., ALTONA, C., DIÉZ, E. & ESTEBAN, A. L. (1984). *J. Mol. Struct.* **125**, 67-88.

LEEUW, H. P. M. DE, HAASNOOT, C. A. G. & ALTONA, C. (1980). *Isr. J. Chem.* **20**, 108-126.

LEHMAN, M. S. & LARSEN, F. K. (1974). *Acta Cryst.* A**30**, 580-584.

MAIN, P., FISKE, S. J., HULL, S. E., LESSINGER, L., GERMAIN, P., DECLERCQ, J.-P. & WOOLFSON, M. M. (1980). *MULTAN*80. *A System of Computer Programs for the Automatic Solution of Crystal Structures from X-ray Diffraction Data.* Univs. of York, England, and Louvain, Belgium.

MOTHERWELL, W. D. S. (1976). *PLUTO.* Program for plotting molecular and crystal structures. Univ. of Cambridge, England.

NESS, R. K., MACDONALD, D. L. & FLETCHER, H. G. JR (1961). *J. Org. Chem.* **26**, 2895-2899.

NORTH, A. C. T., PHILLIPS, D. C. & MATHEWS, F. S. (1968). *Acta Cryst.* A**24**, 351-359.

PEARLMAN, D. A. & KIM, S.-H. (1985). *J. Biomol. Struct. Dyn.* **3**, 85-98.

POPPLETON, B. J. (1976). *Acta Cryst.* B**32**, 2702-2705.

RAO, S. T., WESTHOF, E. & SUNDARALINGAM, M. (1981). *Acta Cryst.* A**37**, 421-425.

ROMERS, C., ALTONA, C., BUIJS, H. R. & HAVINGA, E. (1969). *Topics in Stereochemistry*, edited by E. ELIEL & N. L. ALLINGER, Vol. 4, pp. 39-97. New York: Wiley-Interscience.

SAKORA, T. D. & PANT, L. M. (1966). *Acta Cryst.* **21**, 715-719.

SHELDRICK, G. M. (1976). *SHELX*76. Program for crystal structure determination. Univ. of Cambridge, England.

STRUMPEL, M., BEURSKENS, P. T., BEURSKENS, G., HALTIWANGER, R. C. & BOSMAN, W. P. (1983). 8th Eur. Crystallogr. Meet., Liege, Belgium, Collected Abstracts, p. 269.

WALKER, N. & STEWART, D. (1983). *Acta Cryst.* A**39**, 158-166.

WESTHOF, E. & SUNDARALINGAM, M. (1980). *J. Am. Chem. Soc.* **102**, 1493-1500.

Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (J. H. Robertson, School of Chemistry, University of Leeds, Leeds LS2 9JT, England). As far as practicable books will be reviewed in a country different from that of publication.

Acta Cryst. (1987). B**43**, 223-224

Design, construction and properties of novel protein molecules. Proceedings of a Royal Society Discussion Meeting organized and edited by D. M. BLOW, A. R. FERSHT and G. WINTER. Pp. 159. London: The Royal Society, 1986. Price £27.50.

One of the most intriguing branches of modern molecular science is the 'engineering' of proteins. This is the controlled manipulation of the structure of protein molecules so as to produce, by design, new protein materials - especially new enzymes - for specific medical, pharmacological, industrial or other commercial application.

First, protein crystallography reveals the detailed three-dimensional structure of some particular protein of special interest; next, computer graphics allow the visualization of specific alterations to this molecule (such as the replacement of the side chain of one selected amino acid unit); then genetic engineering and biochemical expertise provide for the actual production of these altered molecules in mg, g or even kg quantities using *E. coli* or other organisms as living factories for the newly contrived protein material.

Crystallographers can find themselves out of their depth here, since the subject is so distant from the tidy world of crystals, and is so densely crammed with biochemical, bacteriological and genetic paraphernalia. The topic is not irrelevant to us, however, as it is the insights opened up by our science, that is, by protein crystallography, which now render the creation of novel protein molecules a practical reality.

Not that such engineering is in full-scale operation: it is not, *yet*. But the prospects are already very exciting indeed, and many prominent scientists and some big chemical industries are today seriously involved.

Realizing the potentiality of protein enginering and the importance of interrelating the relevant specialisms, the Science and Engineering Research Council set up, in June 1985, a '*Biotechnology Directorate*' - a sort of club (or 'invisible college') composed of academic scientists on the one side and industrial firms on the other. The objective was the promotion of a rapid healthy growth of the new science, through free interchange of information, coordination of effort and mutual assistance. (Industrial membership fees are £30 000 but this is considered good value by the rather select giant companies that have joined.) At the same time, the Royal Society has been using its position to stimulate these developments, and this book is the record of the meeting it convened in June 1985, the same month that the SERC set up its Biotechnology Directorate.

The book gives the detailed proceedings of that two-day meeting. It is, in fact, a reproduction of 150 pages of *Philos. Trans. R. Soc. London*, and has duplicate pagination. It consists of some fifteen papers, occasionally including some short points made in discussion. Professor David Blow provides a valuable introduction and, at the end, Max Perutz has some thought-provoking concluding comments.

Although expensive, the book is attractive: it is well produced, well referenced, and about as informative on the subject as it is currently possible to be. It is a pity that there is no index.

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Natürliche und synthetische Rubine: Eigenschaften und Bestimmung. By KARL SCHMETZER, Pp. vi + 131, 31 color photographs, 144 black-and-white photos, 21 figures. Stuttgart: Nägele u. Obermiller, 1986. Price DM 38.00.

This attractive richly illustrated paperback gives a comprehensive survey of the topic of natural and synthetic rubies, their properties and methods of investigation. The author proves that it is possible, by the scientific methods of gem research, to distinguish between natural and synthetic rubies. His experience in this area is based on his own work for the German foundation for gem research (Deutsche Stiftung für Edelsteinforschung) at the Mineralogical Petrographic Institute of Heidelberg University. In his book he tries to take a systematic approach to the subject. He starts with the mineralogy and characteristic properties of corundum and especially of its variety that is ruby. There follows a chapter on the principal methods which are used commercially in the manufacture of synthetic rubies. The material which was used in the experimental investigations, that is, natural and synthetic rubies, is then briefly summarized. The next chapter describes methods of investigation: microscopy (diagnostic features with emphasis on inclusions), absorption spectroscopy (visible, UV, IR), fluorescence (UV and X-ray), goniometry (morphological features of synthetic rubies), chemical analysis (trace elements), X-ray and microprobe analysis (inclusions). After these introductory chapters with a total of 38 pages, the main part of the book is divided into two sections. The first section gives a systematic and detailed description of the characteristic features of natural rubies from different localities all over the world. The second section is an excellent review of otherwise not easily accessible data on the properties of synthetic rubies from various manufacturers. With respect to the distinguishing features, the emphasis is on microscopic characteristics of natural and synthetic rubies. These are presented in 174 photographs of typical growth and inclusion patterns.

The list of references (almost 300) which is given at the end of this book will be most useful to any researcher in the field. In conclusion, *Natürliche und synthetische Rubine* is a very interesting and readable book that will provide those interested in the areas of gem research and gemmology with a great deal of information.

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Books Received

The following books have been received by the Editor. Brief and generally uncritical notices are given of works of marginal crystallographic interest; occasionally a book of fundamental interest is included under this heading because of difficulty in finding a suitable reviewer without great delay.

The chemistry of the actinide elements. 2nd edition, Vols. 1 and 2. Edited by J. J. KATZ, G. T. SEABORG and L. R. MORSS. Pp.: Vol. 1, xii + 996; Vol. 2, xii + 781. London: Chapman & Hall, 1986. Price: £95.00 each Vol.

Landolt–Börnstein: numerical data and functional relationships in science and technology. New Series, Group III. Crystal and solid state physics. Vol. 7. Crystal structure data of inorganic compounds. Part *d*1*γ*: Key elements Ge, Sn, Pb. By W. VON PIES and A. WEISS, edited by K.-H. HELLWEGE and A. M. HELLWEGE. Pp. xxv + 215. Berlin, Heidelberg, New York, Tokyo: Springer-Verlag, 1986. Price DM 630.00.

Fluid-rock interactions during metamorphism. Edited by J. V. WALTHER and B. J. WOOD. Pp. ix + 218. Berlin, Heidelberg, New York, Tokyo: Springer-Verlag, 1986. Price DM 138.00.

Surface crystallography: an introduction to low energy electron diffraction. By L. J. CLARKE. Pp. xiii + 329. Chichester: Wiley, 1985. Price £31.50. A review of this book, by E. G. McRae, has been published in the March 1986 issue of *Acta Crystallographica*, Section A, pages 135–136.