

choice of mechanism. We can take the oxidation of secondary alcohols and of aldehydes by chromic acid in aqueous systems. From the differences in the reaction rates of the normal compound and with the deuterated compound, it has been reported that in both reactions, the rate-determining step involves a rupture of the C—H bond of the secondary alcohol or aldehyde group. From the data on rate constants, while it is possible to infer that this particular bond is involved, the information cannot discriminate between the loss of the hydrogen as a proton or as a hydride ion nor does it indicate any clue to the postulated mechanism.<sup>11,12</sup> Our own findings from a fuller study of the reactions<sup>13-15</sup> requires an entirely different mechanism for the process. It can be noticed from Figs. 1 and 2

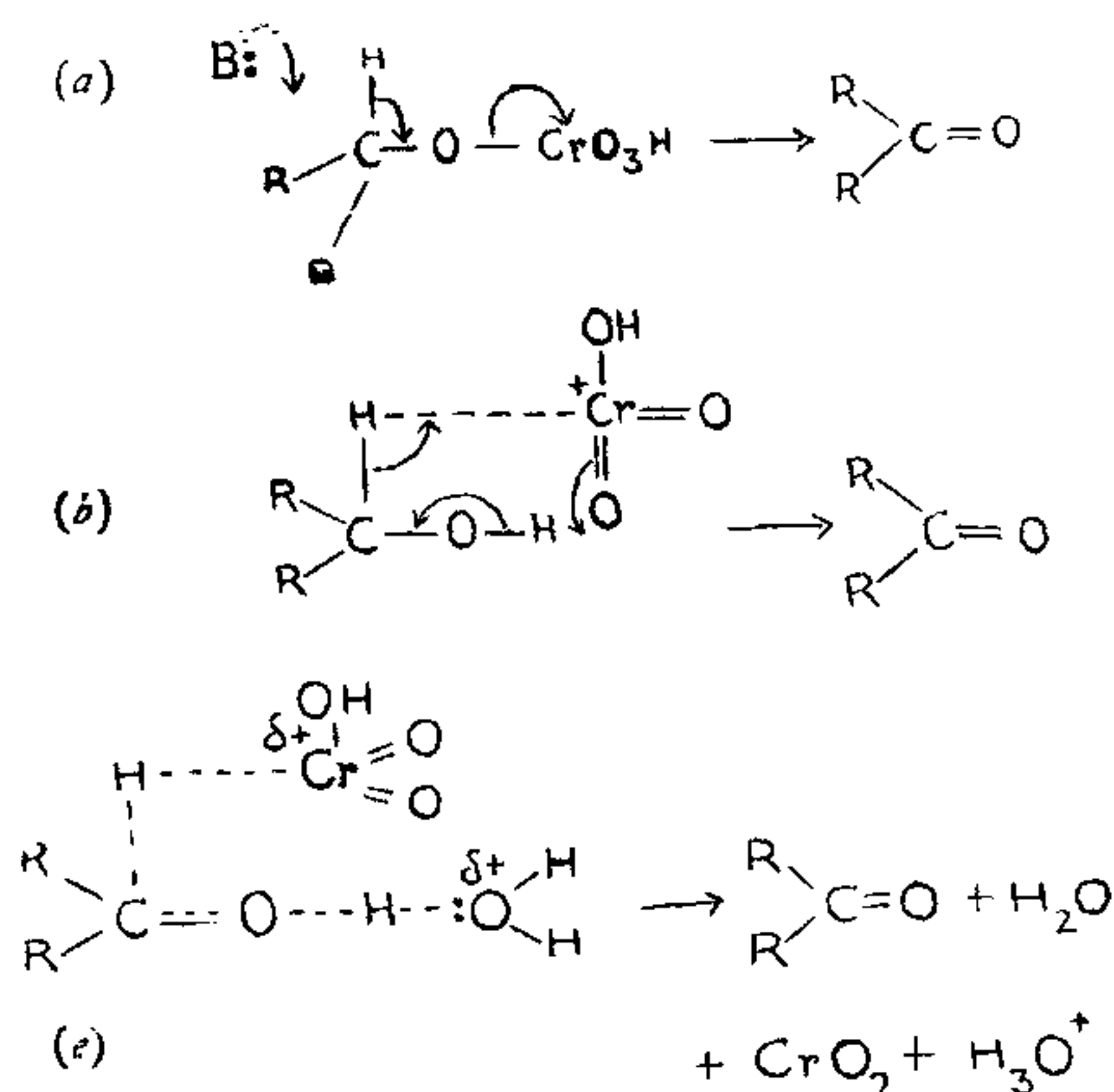


FIG. 1. (a) Westheimer's mechanism for secondary alcohols; (b) Roczek's mechanism; (c) our mechanism.

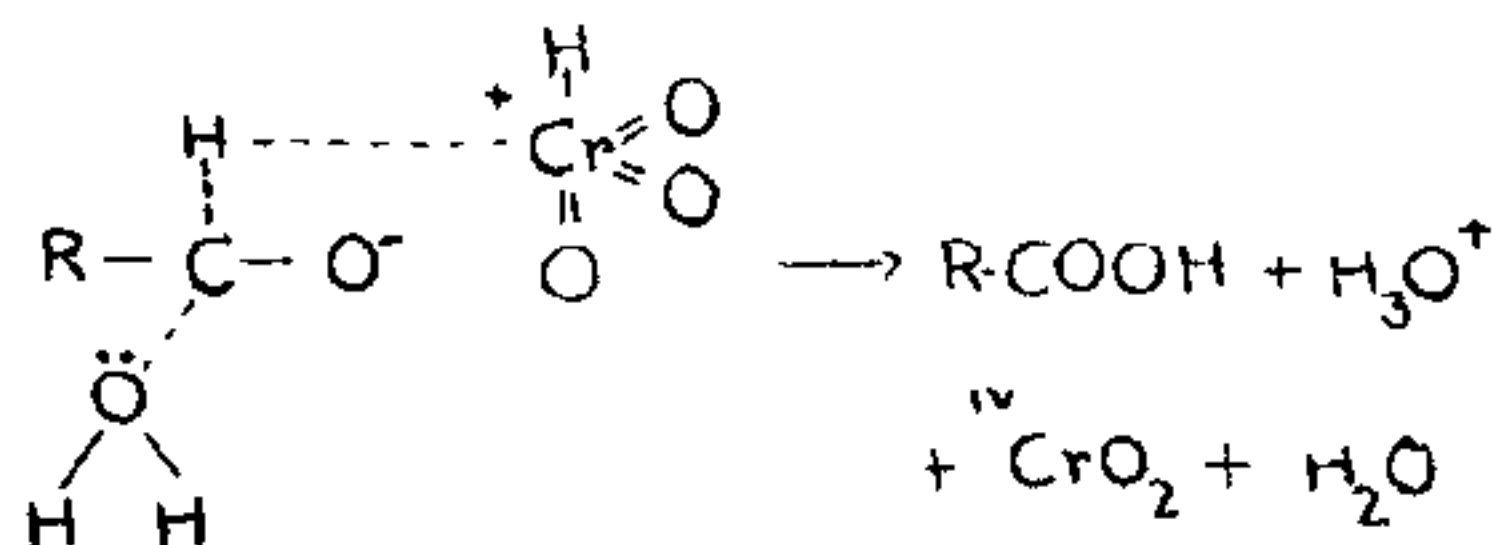


FIG. 2. Aldehyde oxidation: our mechanism.

that isotopic substitution does not enable us to distinguish between the alternative mechanisms. The limitations are further highlighted by the postulate of a similar mechanism for permanganate oxidations also<sup>16</sup> which cannot be justified on the basis of isotope effects.

Oxidations in inorganic systems in solutions are complicated by factors which limit the use of tracer techniques. Ion-pair formation and the influence of ionic strengths have to be reckoned with and there is no *a priori* reason why these should be identical for isotopes. In the absence of extended data at varying ionic strengths and possibly also in different solvents and solvent mixtures, the tracer technique can at best give some qualitative information about the possible path for an assumed configuration of the transition state but cannot be the final arbiter of mechanisms. These can be seen in such reactions as the role of anions in the Fe (III) aquo ion and the iodide ion, Cr (III)-Co (III) reaction and the oxidation of thiosulphates with hydrogen peroxide.

Our thanks are due to the Council of Scientific and Industrial Research for a grant and for the award of a Senior Research Fellowship to one of us (H. J.).

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## THE LINE OF NARMADA-SON VALLEYS—A REVIEW

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WEST<sup>1</sup> has recently drawn attention to the exceedingly interesting earth-feature that he refers to as the 'Narmada-Son Line'. He has pointed out that "It is remarkable...that the

same line should at one time mark the southern limit of the Vindhyan and at a later time the northern limit of the Gondwanas"; also that, "It appears that the Narmada-Son Line may



have been a line of weakness from early times, with the areas to the north and south moving up and down relatively to each other along this line". Earlier, Auden<sup>2</sup> had arrived at similar conclusions and stated that "The Narmada rift is regarded as a major crustal feature of ancient origin, reflecting sub-crustal structure, and influencing the deposition and folding of the Vindhyan and the Gondwanas". The belt of country may partly also correspond to Fermor's<sup>3</sup> 'Satpura Protaxis'; and Ahmad,<sup>4</sup> recognizing that a cratonic area separated the two major Vindhyan basins of central and south India, called it the 'Deccan Craton'. Auden, it appears, also held the opinion that it was a zone of weakness when he stated that it was connected "with some primary weakness parallel to the Archæan grain". Thus, although West prefers to refer to it as a *line*, and points out that in place it separates by only a mile the Vindhyan beds to the north and the Gondwana beds to the south, it would, perhaps, be more appropriate to consider it as a narrow belt of country. Also, this *belt* does not appear strictly to correspond to the 'Narmada-Son Line', for the Son, in its lower course, cuts across the main Vindhyan basin, and the *belt* under consideration exists well to the south of this line.

West is, however, obviously correct in his emphasis that this belt has remained a positive area ever since the pre-Cambrian times. The feature is, nevertheless, by no means without parallel, for several similar belts and wider tracts have been identified in Africa; and the Southern Rhodesian Dome, the Katanga Plateau, and the Lunda Axis are, to mention a few, well-known examples. These have often been referred to as 'swells' and the 'Basin and Swell' structure has been paid particular attention by several geologists in Africa. Holmes<sup>5</sup> thought that these are produced "by differential warping on a regional scale, characteristically accompanied by marginal and internal faulting". Brock,<sup>6</sup> emphasising their significance in tectonism, pointed out that the Structural Map of Africa is "an exposition of basins and swells, that is, ups and downs within an elevated land-mass". These authors, thus, place the upwarped areas in the single category of 'swells'. Bucher,<sup>7</sup> however, classified them into 'swells' that are equidimensional, and 'welts' that show a "distinct linear development". West (personal communication) thinks that "the term 'swell' should be used for non-linear areas". Holmes<sup>8</sup> has given a map of Africa showing the swells and basins

known from that continent, and he, apparently, includes the welts and furrows as well.

Beetz,<sup>9</sup> describing the Lunda Axis, pointed out long ago that it "exists since pre-Cambrian times, and during later geological periods exerted an influence on the geological history of enormous areas both to the north and south of it". It is a comparatively narrow, elongated belt, and in Bucher's terminology this would, perhaps, be recognised as a typical 'welt'. Beetz, however, prefers to call it a 'swell'; and the term appears to be more popular. The Lunda Axis, obviously, appears to offer the closest parallel to West's 'Narmada-Son Line', the parallelism extending to the fact that on the two sides of this Lunda Axis beds equivalent to the Vindhyan were, apparently, simultaneously, deposited, just as on the two sides of the Narmada-Son Line the two major Vindhyan basins existed in India. It, then, seems but reasonable that West's 'Narmada-Son Line' should be recognised as a 'welt' (or a swell), howsoever narrow it may appear in certain parts of its length. Also, a cursory examination of the tectonics of this subcontinent would reveal that many such features exist in India as well. Thus, the Bundelkhand Granite area, the Eastern Ghats region, the 'Fox Ridge' (Ahmad<sup>10</sup>), the uplands along the south of the Godavari, the Nilgiri Plateau and its continuation across the Palghat Gap, and perhaps even the Aravalli Belt, all come immediately to the mind. A detailed study would, perhaps, reveal many others and may enable a map to be prepared, similar to that of Africa. These swells and basins (including welts and furrows) should, then, be given due recognition on any structural map of the country. Indeed, such a study is immediately called for, and is, perhaps, already overdue.

The author is grateful to Dr. W. D. West and Sri. S. C. Chakravarty for going through the manuscript and offering valuable comments.

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