EXTRAPOLATION IN ARRAYS
(DEPTH CLASSIFICATION 43)

Explains the need for Extrapolation, by Octave Device, of isolates thrown forth by the Universe of Knowledge. Studies the incidence of Open and Closed Arrays in different array orders in CC ed 6, DC ed 13, and DC ed 16. Only 4 per cent of the arrays in CC are closed. 22 per cent are closed in DC ed 13 and 26 per cent in Ed 16. In DC ed 16 the percentage of closed arrays shows an erratic fluctuation. The use of Octave Device in DC ed 17 is suggested.

CONTRACTIONS USED

CC Colon Classification
DC Decimal Classification
(AI) Array Isolate
(AIN) Array Isolate Number
(AO1) Array of Order 1
(AO2) Array of Order 2
(AO3) Array of Order 3
etc etc etc
(BC) Basic Class
(IAN) Indo-Arabic Numerals
(IN) Isolate Number
(IT) Isolate Term
[E] Energy Isolate of Round 1
[P] Personality Facet of Level 1 in Round 1
[P2] Personality Facet of Level 2 in Round 1
[2P] Personality Facet of Level 1 in Round 2

0 RESTRICTION IN THE FIELD OF STUDY

The Paper A in this issue describes the universe of knowledge as a dynamic continuum of many dimensions. Hence it may throw forth new (AI) at any point in the continuum at any time. These new (AI) call for their own respective filiative positions among the existing (AI). This position may involve either interpolation or extrapolation among the existing (AI). In this paper we confine ourselves to a comparative study of CC and DC in respect of extrapolation of (AI).

01 Further Restriction in the Field of Study

The comparison is further restricted to extrapolation in zone 2 of an array in CC. This is necessitated by CC using (IAN) in zone 2 only, though DC uses it throughout any array. Thus the entire range of a DC array can be compared only with zone 2 of a CC array.

1 RIGIDITY IN ARRAY

The decimal base of the ten (IAN) is used in DC and in Zone 2 of CC. The digit 0 is used to introduce Common Isolate in DC and as Connecting Symbol for phase.
relation in CC. As a result, only 9 digits are available to represent (AI). If any additional (AI) arises, it looks as if it cannot be represented. This rigidity is imposed by the decimal base. It was felt only in a few arrays by the earlier editions of DC, as the pace of development in the universe of knowledge was slow in their days. Even so, it was not got over in all such arrays. But the development of the universe of knowledge got accelerated. As a result, more than 9 (AI) appeared in many arrays. This outburst in the universe of knowledge made the rigidity in arrays more and more apparent. DC had to deny coordinate status to the new (AI) in excess of 9 in number. It had to put them as subordinate isolates of some far related (AI). This desperate recourse from edition to edition of (DC) resulted in increase of the length of notation, apart from the chaos caused in defiance of the demands of the idea plane regarding the helpful sequence of (AI). This became acute in the schedules of '5 Pure Science' and '6 Applied Science'. For example, Electronic Engineering, which has produced a prolific literary warrant in the present century, is represented by the long number 621.381. One of the ways of avoiding such a difficulty in the notational plane is to increase the versatility of the notational system by some new device.

2 VERSATILITY OF NOTATION

21 Reduction of Rigidity

Since CC also uses (IAN), rigidity occurred in its very first edition, in just a few arrays of its facets. This was brought to conscious level for the first time in the first edition of the Prolegomena in 1937. This became acute in the schedules of '5 Pure Science' and '6 Applied Science'. For example, Electronic Engineering, which has produced a prolific literary warrant in the present century, is represented by the long number 621.381. One of the ways of avoiding such a difficulty in the notational plane is to increase the versatility of the notational system by some new device.

8 new isolate numbers co-ordinate with 1, 2, ... 8, and coming after 8. It is easily seen that by using the empty digit 9 twice, we can get 9 more co-ordinate numbers making the total addition 16. This can be continued ad infinitum—that is, we can extrapolate 8 more co-ordinate numbers each time the empty digit 9 is used. It is the addition of 8 co-ordinate isolates at each step that gave rise to the name 'Octave Device'. It also led to the calling of the empty digit 9 the 'Octavising Digit'. After this idea was brought to conscious level, the schedules in CC were examined and in some of the arrays with rigidity, the digit 9 was made empty. The Canon of Hospitality in Array formulated in the Prolegomena of 1937 was immensely satisfied by the above possibility in the notational plane.

22 Extrapolation in UDC

At the conference of FID/CA (1948) at the Hague, Dr S R Ranganathan brought up the importance of this Carlon and of the usefulness of Octave Device. At the Rome Conference (1950), FID accepted Octave Device for use in UDC. In fact in most of the new arrays formed thereafter by UDC, it is being implemented. It naturally takes more time to implement this device in the earlier cases where 9 had been made a semantically rich digit.

23 Comparative Study of CC and DC

A comparative study of the incidence of open array and closed array in the arrays of different orders occurring in ed 13 and in ed 16 of DC on the one hand and also in the arrays in the diverse facets occurring in ed 6 of CC on the other hand, is made in this paper. We took ed 13 of DC since it was the last edition brought out with the approval and guidance of Dewey himself. Ed 16 was taken as it was the latest edition whose development of schedules was guided by an editorial staff.

3 OPEN AND CLOSED ARRAYS

For purposes of our study, we have taken the following definitions for open and
closed arrays.

Open Array of Kind 1: An array in which the digit 9 is not used to represent any specific (AI) and 91, 92, etc, are used as (IN) co-ordinate with 1 to 8—that is, Octave Device is used.

Open Array of Kind 2: An array in which the digits have not yet been used up to 9 to represent (AI) and 9 is kept free.

Open Array: An Open Array of kind 1 or kind 2.

Closed Array: An Array in which the digit 9 has been made semantically rich, thus sealing the array and making extrapolation by Octave Device impossible.

Note: For purposes of calculating the order of an array, the Universe of knowledge is taken to be the array of order 0 in DC and each (BC) as the array of order 0 in CC.

31 Summary Table 1: Measure of Freedom

The following Table gives the total number of Open arrays of Kind 1, Open arrays of Kind 2 and closed arrays in all the arrays in CC ed 6, DC ed 13 and DC ed 16.

<table>
<thead>
<tr>
<th>Schemes and Edition</th>
<th>Open Array of Kind 1</th>
<th>Open Array of Kind 2</th>
<th>Closed Array</th>
<th>Total N of Arrays</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Numb</td>
<td>%</td>
<td>Numb</td>
<td>%</td>
</tr>
<tr>
<td>CC ed 6</td>
<td>161</td>
<td>12</td>
<td>1,150</td>
<td>84</td>
</tr>
<tr>
<td>DC ed 13</td>
<td>306</td>
<td>6</td>
<td>3,473</td>
<td>72</td>
</tr>
<tr>
<td>DC ed 16</td>
<td>189</td>
<td>4</td>
<td>3,078</td>
<td>70</td>
</tr>
</tbody>
</table>

Notes: 1 In DC ed 13, the open arrays using Octave Device form 6% of the total arrays. Closed arrays are only 22%. The arrays in which the digit has not been reached form as high as 72%. This is a measure of the freedom to use more of Octave Device.

2 In DC ed 16, the percentage of open arrays using Octave Device decreases from 6 to 4. There is a corresponding increase in the number of closed arrays, the percentage increasing from 22 to 26. Thus the measure of freedom to use more of Octave Device has dropped from 72 to 70.

3 There is a decrease of 438 arrays from edition 13 to edition 16.

This decrease is the result of a decrease of 117 open and 395 not-reached arrays and an increase of 74 closed arrays. These figures disclose the deviation of DC ed 16 from DC ed 13 and its negative leaning towards the use of Octave Device. The absence of Dewey becomes apparent.

4 In CC ed 6, the percentage of closed arrays is as low as 4. The percentage of open arrays of kind 1 is double that of DC ed 13 and treble that of DC ed 16. The measure of freedom to use more of Octave Device is 84.

32 Summary Table 2: Total of Open Arrays

<table>
<thead>
<tr>
<th>Scheme and Edition</th>
<th>Open Array of Kind 1 &amp; Open Arrays of Kind 2</th>
<th>Closed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Numb</td>
<td>%</td>
<td>Numb</td>
</tr>
<tr>
<td>CC ed 6</td>
<td>1,311</td>
<td>96</td>
<td>53</td>
</tr>
<tr>
<td>DC ed 13</td>
<td>3,779</td>
<td>78</td>
<td>1,067</td>
</tr>
<tr>
<td>DC ed 16</td>
<td>3,267</td>
<td>74</td>
<td>1,141</td>
</tr>
</tbody>
</table>
EXTRAPOLATION IN ARRAYS

Notes:

1. The percentage of open arrays in CC is as high as 96.

2. The percentage of open arrays in DC ed 13 is also as high as 78, inspite of the fact that the Octave Device was objectively and explicitly defined only 2 years before the edition was published.

3. There is a 4% decrease in the number of open arrays in DC ed 16. Correspondingly there is a 4% increase in the number of closed arrays. What does it signify? Are the editors of DC ed 16 trying to reverse the trend foreseen by Dewey with respect to open arrays?

4. If the editors of DC succeed in recapitulating the vision of Dewey in keeping arrays open, we may hope that ed 17 will have more number of open arrays.

33 Open and Closed Arrays for Each Array-Order

The following table gives the absolute figures of the number of open and closed arrays of each order, along with their percentage of occurrence.

331 Table for CC Edition 6

<table>
<thead>
<tr>
<th>Array Order</th>
<th>Open No.</th>
<th>%</th>
<th>Closed No.</th>
<th>%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>134</td>
<td>92</td>
<td>11</td>
<td>8</td>
<td>145</td>
</tr>
<tr>
<td>2</td>
<td>373</td>
<td>96</td>
<td>16</td>
<td>4</td>
<td>389</td>
</tr>
<tr>
<td>3</td>
<td>469</td>
<td>97</td>
<td>16</td>
<td>3</td>
<td>485</td>
</tr>
<tr>
<td>4</td>
<td>251</td>
<td>97</td>
<td>9</td>
<td>3</td>
<td>260</td>
</tr>
<tr>
<td>5</td>
<td>76</td>
<td>99</td>
<td>1</td>
<td>1</td>
<td>77</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>1,311</td>
<td>96</td>
<td>53</td>
<td>4</td>
<td>1,364</td>
</tr>
</tbody>
</table>

332 Table for DC ed 13

<table>
<thead>
<tr>
<th>Array Order</th>
<th>Open No.</th>
<th>%</th>
<th>Closed No.</th>
<th>%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>100</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>20</td>
<td>8</td>
<td>80</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>27</td>
<td>27</td>
<td>73</td>
<td>73</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>244</td>
<td>55</td>
<td>198</td>
<td>45</td>
<td>442</td>
</tr>
<tr>
<td>5</td>
<td>800</td>
<td>78</td>
<td>355</td>
<td>30</td>
<td>1155</td>
</tr>
<tr>
<td>6</td>
<td>1162</td>
<td>80</td>
<td>291</td>
<td>20</td>
<td>1453</td>
</tr>
<tr>
<td>7</td>
<td>527</td>
<td>89</td>
<td>64</td>
<td>11</td>
<td>591</td>
</tr>
</tbody>
</table>

333 Table for DC ed 16

<table>
<thead>
<tr>
<th>Array Order</th>
<th>Open No.</th>
<th>%</th>
<th>Closed No.</th>
<th>%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>100</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>30</td>
<td>7</td>
<td>70</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>27</td>
<td>27</td>
<td>73</td>
<td>73</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>390</td>
<td>64</td>
<td>229</td>
<td>37</td>
<td>619</td>
</tr>
<tr>
<td>5</td>
<td>1031</td>
<td>73</td>
<td>377</td>
<td>27</td>
<td>1408</td>
</tr>
<tr>
<td>6</td>
<td>1143</td>
<td>74</td>
<td>403</td>
<td>26</td>
<td>1546</td>
</tr>
<tr>
<td>7</td>
<td>576</td>
<td>94</td>
<td>37</td>
<td>6</td>
<td>613</td>
</tr>
<tr>
<td>8</td>
<td>88</td>
<td>88</td>
<td>12</td>
<td>12</td>
<td>100</td>
</tr>
<tr>
<td>9</td>
<td>12</td>
<td>80</td>
<td>3</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>3,267</td>
<td>74</td>
<td>1,141</td>
<td>26</td>
<td>4,408</td>
</tr>
</tbody>
</table>

All the three tables are featured as graphs on page 36.

4 ANNICATION: OPEN ARRAYS

41 CC ed 6

The curve for open arrays for CC starts very near the roof and flows upwards with a negligibly small slope. This is because in (AO1) itself the percentage of open arrays is as high as 92. There is a gradual increase in the percentage of open arrays with the increase of the array-order. In (AO6), the possible maximum of 100 is reached. This indicates the extensive use of Octave Device in CC though unconsciously at the beginning in its earlier arrays.

42 DC ed 13

DC ed 13 gives a smooth curve for open arrays with an almost linear increase in the percentage of open arrays with the increase of the array-order. The percentage of open arrays in (AO1) is 0. In (AO3) it is 28. And in (AO9) it is as high as 93. Thus the percentage of open arrays in the
GRAPH OF OPEN AND CLOSED ARRAYS
in CC ed 6, DC ed 13 and DC ed 16
EXTRAPOLATION IN ARRAYS

last order of array of DC ed 13 corresponds to that in the first order of array of CC. The high percentage is mainly due to the arrays in which the digit 9 has not yet been reached accounting for nearly 88% of the total number of arrays used. Perhaps, the relatively high percentage of open arrays left in the later arrays of DC ed 13, gives an indication of the vision of Dewey regarding the necessity for extrapolation of new (AI) by use of some such device as the Octave Device.

43 DC ed 16

The curve for open arrays for DC ed 16 gives a general upward movement with the increase of the array order. But it makes erratic fluctuations. It drops below the curve for DC ed 13 after (A07).

What does this erratic fluctuation signify? Can we infer that the editors of DC ed 16 have been guided neither by intuition which Dewey had, nor by intellectual reasoning which would have been possible if they had recognised the attributes which the notational system would have?

5 ANNOTATION: CLOSED ARRAYS

1 The percentage of closed arrays in CC does not exceed in any order of array. There is a gradual decrease with the increase of array order. In (A06), the possible minimum of zero is reached.

2 There is decay in the percentage of closed arrays in DC ed 13 with the increase of array-order.

3 The curve for DC ed 16 shows an erratic movement. Though it follows in general the curve for DC ed 13, it crosses it in five places. Though in (A07), the percentage of closed arrays is even less than that of DC ed 13, there is a gradual increase from (A07) to (A09). This indicates that the editors of DC ed 16 are not using the Octave Device consciously to increase the hospitality of its arrays.

6 OPENING UP CLOSED ARRAYS

Both in CC and DC there are cases of truly closed arrays. There are also other kinds of apparently closed arrays. These are caused by the use of spurious terms and generic terms. The following table indicates the meaning of these terms.

<table>
<thead>
<tr>
<th>Ser N</th>
<th>Category</th>
<th>Giving against the (AIN) ending with 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spurious</td>
<td>A spurious term such as &quot;Others&quot; &quot;Special&quot;.</td>
</tr>
<tr>
<td>2</td>
<td>Generic</td>
<td>A generic term comprehending all the isolate terms occurring in the octave started by 9.</td>
</tr>
<tr>
<td>3</td>
<td>True</td>
<td>A specific isolate term</td>
</tr>
</tbody>
</table>

Notes: 1 Category 1 can be made an open array by omitting the spurious terms used against the (AIN) ending with the digit 9.

2 Category 2 is in reality a case of open array. It merely happens that the isolates in a single Octave admit of being denoted collectively by a generic term.

3 Category 3 can be opened in some cases by making the (AIN) ending with the digit 9 into an (AIN) ending with the number 91.

7 OPENING UP TRULY CLOSED ARRAYS IN DC ed 16

71 First Order Array

The class 'History' is a hotch-potch. The following way of opening up (AO1) is suggested.

- 91 Geography
- 92 History

This will give co-ordinate status to Geography and History. The remaining numbers 93 to 98 are available for future use.
72 Second Order Array
721 Spurious Terms Against Digit 9

<table>
<thead>
<tr>
<th>Ser N</th>
<th>(BC)</th>
<th>(IN)</th>
<th>(IT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>29</td>
<td>Other Religions</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>49</td>
<td>Other Languages</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>89</td>
<td>Other Literature</td>
</tr>
</tbody>
</table>

These can be opened up by dropping the spurious (IT).

722 Generic Term Against Digit 9

<table>
<thead>
<tr>
<th>Ser N</th>
<th>(BC)</th>
<th>(IN)</th>
<th>(IT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>19</td>
<td>Modern Philo-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>sophy</td>
</tr>
</tbody>
</table>

723 Truly Closed Arrays

<table>
<thead>
<tr>
<th>Ser N</th>
<th>(BC)</th>
<th>(IN)</th>
<th>(IT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>09</td>
<td>Manuscripts and rare books</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>39</td>
<td>Customs and folklore</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>59</td>
<td>Zoological sciences</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>69</td>
<td>Building construction</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>79</td>
<td>Recreation</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
<td>99</td>
<td>Pacific ocean islands</td>
</tr>
</tbody>
</table>

724 Arrays of Higher Order

Thus half of the (AO2) can be opened out. A similar scrutiny must be made of the arrays (AO3) to (AO9) by the Editors of DC ed 17 before finalising it.

8 OPENING UP CLOSED ARRAYS
IN CC ed 6
81 Spurious Terms Used Against Digit 9

<table>
<thead>
<tr>
<th>Ser N</th>
<th>(BC)</th>
<th>Facet</th>
<th>(IN)</th>
<th>(IT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D</td>
<td>[P]</td>
<td>4169</td>
<td>Other Bridges</td>
</tr>
<tr>
<td>2</td>
<td>D</td>
<td>[P]2, [P]2</td>
<td>9</td>
<td>Ventilation</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>[P]411,[P]2</td>
<td>9</td>
<td>Other part</td>
</tr>
<tr>
<td>4</td>
<td>D</td>
<td>[P],415,[P]2</td>
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<td>Other part</td>
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<td>D</td>
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<td>59</td>
<td>Other nitrogen compounds</td>
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<td>7</td>
<td>E</td>
<td>[E]</td>
<td>89</td>
<td>Other methods</td>
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<td>8</td>
<td>G</td>
<td>[E][2P]</td>
<td>59</td>
<td>Other habits</td>
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<td>9</td>
<td>H2</td>
<td>[P]</td>
<td>119</td>
<td>Other volcanic rocks</td>
</tr>
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<td>10</td>
<td>H2</td>
<td>[P]</td>
<td>179</td>
<td>Other pluto-</td>
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<td>11</td>
<td>J</td>
<td>[E][2P]</td>
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<td>Other</td>
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<td>13</td>
<td>L</td>
<td>[2E][3P]</td>
<td>69</td>
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<td>Other mate-</td>
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<td></td>
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Note: The above arrays can be opened by deleting the spurious (IT).
82 Generic Term used Against the Digit 9

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<th>(IT)</th>
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<tbody>
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<td>[P2][7],[P3]</td>
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<td>Interlocutory proceedings</td>
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</table>

These are in reality open.

83 Truly Closed but can be Opened

<table>
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<tr>
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These are truly closed. But the subdivisions in these arrays are such that they can be easily opened up.

84 Truly Closed and Cannot be Opened

The following arrays cannot be easily opened up as they have been subdivided extensively.

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<td>[P3]</td>
<td>9</td>
<td>Materials for practice, Readers</td>
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<tr>
<td>4</td>
<td>V</td>
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<td>19</td>
<td>Foreign</td>
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</table>

Notes: 1 In the case of E[P] 109 Radon etc, they need not be changed to 91 as the Inorganic Substances have been arranged according to the Periodic Table and the number of elements in a period is fixed. Hence there is no need for extrapolation in the case of these arrays.

2 In the case of J[P] 169 Bulb, it is a printer's mistake. It should read 168.

3 In the case of X[P] 6529 Industrial, it is again a printer's mistake. It should read 6528.

4 In the case of X[E] 9 Labour, it is only a shorter substitute for 8Y. 9 can be released if necessary.

5 The irrevocably closed arrays are only 4 in C CarEd 6. But some way should be found to open them out.

91 A LEAF TO DC ed 17

The rigidity inherent in the decimal base (IAN) should be removed to meet the demands of the Universe of Knowledge. This can be done by the use of Octave Device. The Octave Device is a vital contribution to the notational scheme of Classificatory language. One can comprehend this device as one of its necessary attributes easily, if class numbers are conceived as a system of ordinal numbers. In this paper, only an attempt has been made to show a few glimpse-
ses of the use to which the Octave Device can be put to increase the resilience and the helpfulness of the arrangement of the (AIN) in the schedules of DC. The paper also indicates the enormous scope for its application in the future editions of DC. It is hoped that the attention of the editors of DC will be turned in this direction and that they will conduct further an elaborate and exhaustive study of the problems and the possibilities of using the Octave Device in DC. Can it be expected that in the near future DC will fall in line with CC and UDC to solve one of the major but relatively simple problems in the notational history of classification?

Acknowledgement

We are grateful to Dr S R Ranganathan for guiding us in this study.