ARNO PETERS' CULT OF THE 'NEW CARTOGRAPHY':
From Concept To World Atlas

Peter Vujakovic

This paper reviews the work of Arno Peters to date, including the Peters Atlas of the World, which it's publishers claim "...represents the greatest single advance in map-making in over 400 years." The paper includes material from an interview given to the author by Peters during a visit to the UK to publicise the Atlas.

Introduction

The publication by Longman of the 'Peters Atlas of the World' earlier this year, represents a significant milestone in Arno Peters' promotion of his 'new cartography'. Peters has been mounting an attack on the bastion of 'traditional' cartography since the 1970's.

Cartography's Iconoclast?

In 1952 Professor Peters published his 'Synchronoptische Welgeschichte' ('Synchronoptic World History'). This was an attempt to provide an objective, 'universal' world history, in which the emphasis was not on Europe, but gave equal weight to other world cultures. He was attempting to bring equality and balance to the treatment of history (Peters, pers. comm.). It was during this period that he became increasingly interested in global maps and cartography. In his history he portrays cartography as one of the important factors in the formation of human awareness:

"Maps have been made for almost five thousand years and for almost the last three thousand they have been instrumental in forming our global concept." (Peters, 1983, p.149).

In seeking for the causes of national arrogance and xenophobia he claims he was continually led back to world maps as a major influence on people's view of the world around them. His belief that a Eurocentric view of the world is still a potent image is given credence by recent studies (eg. Saarinen, 1988; Saarinen et al, 1988).

During the preparation of an atlas volume to accompany his history he became disillusioned with existing global maps, which were "...worthless for an objective representation of historical situations and events." (Peters, 1983, p.146). This convinced him that a revision of cartographic practices was long overdue. The cartographic profession, by its retention of old precepts derived from a Eurocentric world view, is seen as incapable of developing an egalitarian global map.

The results of Peters' review were the development of his own global projection (first shown to the Hungarian Academy of Sciences in Budapest in 1967 (Loxton, 1985)) and a dissertation, 'Die Neue Kartographie' ('The New Cartography') (1983).

'The New Cartography' describes the emergence and development of global maps up to the Mercator projection of 1569. According to Peters the need for a new cartography must be viewed in relation to the Mercator map "... which has dictated our geographical world concept for the last four centuries." (Peters, 1983, p.56). Peters view of Mercator is far from totally negative. He sees it as a vast improvement on previous maps, especially in its use of a rectangular grid. However, it is the lack of 'fidelity of area' which disqualifies it as a universally acceptable global map. Peters (pers. comm.) claims that his own solution (the so called "Peters projection") is in fact derived from principles used by Mercator, but he has been able to add fidelity of area to Mercator's good points.

He is dismissive of other projections which are an attempt to overcome problems inherent in the Mercator world map. Other equal-area projections are seen as being achieved by abandoning important features of the Mercator; such as parallel lines of latitude and longitude ('fidelity of position').

Under the chapter title 'Taking Stock' Peters (1983) attempts to strip away some of the 'myths' of traditional cartographic teaching. He concludes that the teaching consists "... of half truths, irrelevancies and distortions." (p.102). His critique focuses on ten 'myths':

1. Fidelity of Angle.
2. Incompatibility.
3. The Arbitrary or Compromise Map.
4. The Teaching of Projection.
5. Tissot's Indicatrix.
6. The Scale.
7. Equatorial Orientation.
10. Thematic Cartography.

A number of these so called 'myths' are not new to (or disputed by) many cartographers and geographers. For example, Peters' observation that the use of a representative fraction or a linear scale on a small-scale map of a large area without qualification is extremely misleading (myth 6). However, while it is true to say that this is accepted by cartographers, Peters is correct in pointing out that such scales continue to be used (see for example the "Family Atlas of the World" (6 parts); free to over one million households and organisations taking "The Sunday Times" in 1988).

Other of his observations are open to dispute on cartographic grounds. Robinson (1985) provides an important critique of Peters arguments. He describes the 'myths' as straw men used by Peters to condemn the cartographic profession, and his arguments as absurd and spurious. For instance, Robinson notes:
"To Peters, the term winkelredu does not denote (as it does to all cartographers) the precise property of conformality, namely, that at each point the Scale Factor is the same in all directions. Instead, he asserts that it simply means angles on the globe are retained on the map." (p.105).

Peters follows his critique of traditional cartography with his own catalogue of 'attainable map qualities' (table 1) which forms the basis of the 'new cartography'. This catalogue includes 'fidelity of area' (area distortion equal to zero) and 'fidelity of axis' (a rectangular graticule); without these a global map cannot have the quality of 'universalis' (a single projection that can be used for all general maps of the world or parts of it).

Table 1. Attainable map qualities. (Adapted from Peters, 1983).

<table>
<thead>
<tr>
<th>Mercator</th>
<th>Hammer</th>
<th>Peters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1569</td>
<td>1892</td>
<td>1974</td>
</tr>
<tr>
<td>Fidelity of Area</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>Fidelity of Axis</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>Fidelity of Position</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Fidelity of Scale</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Proportionality</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Universality</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Totality</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Supplementality</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>Clarity</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Adaptability</td>
<td>✓</td>
<td>X</td>
</tr>
</tbody>
</table>

Peters compares his projection with eight others (including Mercator and a number of other equal-area maps, eg. Hammer's (1892) projection. It comes as little surprise to find that only the Peters projection fulfills all ten categories (table 1). No other projection quoted scores higher than four. (It is worth noting that Peters does not include Lambert's (1772) cylindrical equal-area projection in this list, although it is mentioned elsewhere in his book).

Peters then explains the construction of his own projection and discussed the wider attributes of a 'new cartography'. These range from a repositioning of the zero meridian and a decimal grid system to a 'New World Concept' and 'New Attitude' (Peters, 1983; New Internationalist, 1983; Stalker, 1989). Peters sees his 'new cartography' as the basis of a new, objective, egalitarian, global concept.

Peters concludes with a final broadside at the cartographic profession. He claims that it is totally incapable of developing an egalitarian world map due to "...its retention of old precepts based on the Eurocentric global concept,..." (p.149). While the revolutionary character of his "...new cartography lies in its defeat of the ideologies which have hitherto stamped all worlds maps." (p.150).

Peters' message and map were rapidly accepted outside of the cartographic profession; particularly by organisations involved in world development issues. With the publication of his world map on the covers of the two Brandt reports (1980; 1983) it became a symbol of concern for development and of the North-South divide (Vujakovic, 1987).

The Shock of the New

Against a background of increasingly visible support for the Peters projection, cartographers and geographers began to take the Peters phenomenon seriously. In an article entitled 'Map Wars', Stalker (1989) claims that "... some academic cartographers are provoked into fits of rage by the very mention of the Peters projection, accusing it of all sorts of sins." (the author has experienced this very reaction from a member of the editorial panel of a respected cartographic journal). Stalker is probably right in suggesting that some of the criticism is due to the closing of ranks against an outsider.

The reaction against Peters' map focuses on a number of key issues. Objections have been raised as to its cartographic validity (Maling, 1974; German Cartographical Society, 1985; Loxton, 1985; Robinson, 1985). Even, its claim to be an equal-area projection has been disputed. Maling (1974) states that measurement of the graticules of the Peters projection unveiled in 1973 shows that the spacing of the meridians is consistent with a cylindrical equal-area project of standard parallels at 46°20' North and South, "... whereas the spacing of the parallels corresponds to some other variant ... In other words, Peters' projection is not equal-area." (p.510).

Its originality is also disputed by Maling (1974), Loxton (1985), Robinson (1985) and Baker (1986). Maling and Loxton see the projection simply as a variant of the Lambert (1772) cylindrical equal-area projection (with standard latitude at the equator). Other variants have been produced using different standard latitudes; for instance Behmann (1910) chose 30° North and South (believing that this displayed the least overall angular distortion). Robinson and Baker claim that the so called Peters projection was first presented to the British Association for the Advancement of Science by James Gall in 1855 and published later that year in the Scottish Geographical Magazine (Gall, 1855). Gall's Orthographic projection is a cylindrical equal-area projection with standard latitudes at 45° North and South, which closely corresponds to the Peters projection. Peters (1983) does acknowledge the existence of Lambert's projection, but objects to its distortion of Europe. He claims not to have been aware of the Gall variation until recently and has not as yet seen documentary evidence (Peters, pers. comm.).

Peters' new cartography would be an effort to correct for the errors of the Mercator projection which he claims to be "in its reticulation North and South, 45°20'" (p.144). It is clear that Peters was not unaware of the Mercator projection.

Other critiques have been concerned with whether the Peters map really does provide a better alternative to existing maps. Bain (1984) assesses its importance as a general educational aid. He is not convinced that it is any better than other existing equal-area projections, many of which are less distorting of continental shapes than Peter’s. This problem of the severe distortion of is a major source of dissatisfaction with the projection amongst professional cartographers. Robinson (1985) suggests that Peters’ "... landmasses are somewhat reminiscent of wet, ragged, long winter underwear hung out to dry on the Arctic Circle." (p.104). However, both Bain (1984) and Vujakovic (1987) note that this distortion is perceived as a benefit by some of Peters' supporters, as it challenges contemporary 'world views'. Vujakovic (1989) has focused on the role of the Peters map in development education. He concludes that
Peters' insistence that certain map qualities must be retained (eg. his 'cult' of 'fidelity of area') may actually be hindering the use of appropriate maps in development education. The authors of two recent thematic atlases have argued against its use as a global base map (Kidron & Segal, 1981; Crow & Thomas, 1983), preferring other equal-area projections.

While many of the points made by Peters' critics appear valid, there does seem to be an unwillingness to acknowledge any contribution by him to the cartographic debate. There can be no doubt that Peters has raised public awareness of the importance of maps. Stalker (1989) believes that it is this which has most galloped the cartographic profession. He quotes Arthur Robinson:

"The real danger is not the projection ... but instead the long-term harm that can be done to the profession as a consequence of the techniques Peters is using to promote his map. He is clever." (p.109).

It is interesting to note that the National Geographic Society has recently replaced its old global map (Van der Grinten) with one produced by Arthur Robinson (Sunday Times, 1/1/89, p.3). This new projection is supposed to be a more realistic world view (even though it still suffers from area distortion). In an article introducing the new projection (Garver, 1988), the National Geographic's chief cartographer studious manages to avoid much of the debate about the desirable qualities of world maps that Peters has generated.

The 'Peters Atlas of the World'

The 'Peters Atlas of the World' (1989) is the culmination of ten years of work by Arno Peters. It is the latest manifestation of his crusade to supplant traditional cartography with his 'new cartography'. The publication of the atlas offers an ideal opportunity to study the practical application of Peters' cartographic principles. To date this has been limited to an examination of the occasional and partial use of the Peters projection by his supporters (Vujakovic, 1989).

The atlas is divided into two major parts; a topographic map section and a thematic section. Each part will be reviewed separately before turning to the wider implications of the atlas, which it's publishers, claim "... is set to become the standard recommended quality atlas".

i) Topographic section

The topographic section consists of "The World in 43 maps at the same scale." The use of the same scale for all of the topographic maps is one of a number of key innovations that are claimed for this section, based on arguments put forward by Peters in 'The New Cartography' (1983). Terry Hardaker (the cartographic editor) argues that all previous world atlases have been totally inconsistent in their use of scales; he declares:

"We have come to accept as 'natural' a representation of the world that devotes disproportionate space to large scale maps of areas perceived as important, while consigning other areas to small-scale general maps." (Peters, 1989, p.6).

Consistent with Peters' arguments against the use of linear distance scales on world and small scale regional maps, the scale he uses is defined by the quality of 'fidelity of area'.

All of the topographic maps in the atlas have an equal area scale (one square centimetre on the map equals 6,000 square kilometres in reality). One-sixtieth of the earth's surface is displayed on each map. This is supposed to represent a fairer and more equitable view of the world.

This 'challenge' to people's misconceptions concerning the relative sizes of counties and regions is a valid one and to some extent it may work. The compilers of the atlas ask us to compare the British Isles (p.32) with Madagascar (p.47). It is readily apparent that the atlas does provide a very different emphasis to that seen in 'traditional' world atlases published in Britain. However, problems are also immediately obvious; for example, many large countries and regions are never seen in their entirety on a single map. This makes certain types of geographical comparisons more, rather than less, difficult. The Soviet Union for instance, is spread over nine separate maps and the United States over five maps.

Another problem caused by the single scale is over emphasis on human settlement with small populations in sparsely settled regions. Contrast some of the sparsely populated semi-arid states of Africa with parts of densely populated Europe. For example, Botswana and France have similar land areas, but very different population sizes (approximately 1 million and 55 million respectively in the mid 1980's), yet France appears to have only twenty-five more settlements within the categories used in the atlas. A major problem here is the lack of a lower limit for the smallest class of settlement shown (less than 100,000). All forty-nine settlements shown for Botswana fall within this category (the total urban population only just exceeded 160,000 in 1981), while France would appear to have only twenty-nine! This is obviously meaningless. These problems clearly run counter to Peters' intention of producing an objective world atlas. His simplistic classification of infrastructure ('communications') also causes similar problems to informative and objective comparisons between countries and regions.

Many authors have been highly critical of the extreme distortion of the continents on Peters global map (eg. Bain, 1984; Robinson, 1985). This problem is also to be found in the topographic section. Although the grid for each topographic map has been recalculated to remove the worse distortions of the world map, problems still remain. For example, while the map of north west Europe (p.32) now shows the British Isles with minimal distortion compared to their shape on the global projection., Iceland is still very badly distorted (elongated along its east-west axis). An interesting and unfortunate product of recalculating the individual grids is that some land masses have become more distorted at the larger scale! New Zealand, which was relatively undistorted at the global scale, is now very much worse (p.79). Such distortions also condition our perception of other geographic features, for instance, island chains, river systems and mountain ranges. A good example of this problem can be seen on pages 30-31, where the southern tip of South America and the Falkland Islands are severely distorted. It is also well illustrated by the Soviet and Canadian island groups of the Arctic Ocean (pp.12-13 and 50-51). An attempt is made to resolve this problem of distortion by the
use of a new (unnamed) projection to display the polar regions (the final eight maps of the topographic section). Peters also discusses this problem in 'The New Cartography' (1983, p.115) and describes the method by which the polar regions can be redrawn. Unfortunately this new projection lacks a number of the attributes Peters claims are key to the 'new cartography' (eg. 'fidelity of axis'). The use of a different projection also compromises his claim of 'Universality' and 'Adaptability' for the Peters projection (1983).

Another 'innovation' is the use of colour to represent variation in 'ground cover', rather than elevation. Browns and greens are used to indicate bare ground and dense vegetation respectively, while thin or scattered vegetation is shown in intermediate colours. NOAA-AVHRR (USA) satellite imagery was used as the basis of a land cover survey for the atlas by the Remote Sensing Unit of Bristol University (Lloyd and D’Souza, 1987).

The NOAA-AVHRR images do not appear in the atlas, but provided the information on ground conditions which was then transferred to the topographic base maps by traditional hand colouring. Hardaker claims that this makes it "... the most up-to-date statement available of world vegetation distribution." (Peters, 1989, p.6). Peters (pers. comm.) claims that the satellite imagery was not included because it would have required a detailed explanation and detracted from his aim of keeping the atlas as simple as possible. He noted his disquiet at the way in which photographs and satellite images were being incorporated into modern atlases at the expense of maps. Peters says he wants to retain the feeling of old style atlases, while using developments in computer cartography to improve accuracy of content (Peters, 1989, p.7). However, it can be argued that Peters has missed an opportunity to show the dynamic nature of global environmental systems. The AVHRR imagery provides a dramatic picture of temporal changes in ground cover conditions at world and regional scales (eg. the Sahel (Tucker and Justice, 1986)). A small section devoted to this in the topographic or thematic section would have been valuable, especially with increasing public concern for global environmental issues such as 'desertification' and 'deforestation'. As it stands, the atlas simply provides a 'snap-shot' of conditions at one moment in time, hence, only a partial view.

To give the maps the impression of relief, photographs were taken of three-dimensional models of the earth's surface. The photographs were used as base maps and enhanced by hand shading. Elevation is simply given by the use of occasional spot heights.

ii) Thematic section

The thematic section of the atlas consists of one hundred and forty-six maps each with a single theme, representing over 40,000 individual pieces of factual data (Peters, 1989).

The publishers, make impressive claims for this section. In their 'press information' they announced that the maps "... provide an unrivalled reference resource of factual information: a complete and in-depth picture of today's world." However, a number of problems with regard to both the cartography and the geographical content of this section are readily apparent.

Firstly, the appropriateness of the Peters projection as the basis for all of the thematic maps is open to question. For instance, the maps showing the movement of continental masses over the past 560 million years (p.98-99) are good examples of inappropriate use. The continental shapes are very severely distorted in many instances (especially that of Antarctica), making relationships between the land masses difficult to understand. Peters is effectively surrendering the flexibility of cartography to sustain his own 'myth' that his projection is universally applicable. This contrasts with Peters use of a compromise projection in the topographic section.

Another factor which is immediately obvious is that a Euro-Afrocentric projection is used for every one of the thematic maps. Yet Peters sees 'Supplementability' as one of the ten desirable qualities of a world map (the ability to 'cut' the map so that any continent can be placed centrally). It is surprising that an atlas which seeks to "... make possible a fundamental change in our conception of the world." (Peters, 1989, p.3) should not use this facility to challenge our supposed Eurocentric global concept, which is Peters major reason for developing his 'new cartography' (Peters, 1983). Peters (pers. comm.) unconvincingly claims that he has not used other 'cuts' because this is an added "problem" for users of an atlas which already contains a wide range of innovative features. However, non-Eurocentric projections are now commonplace in modern atlases and are unlikely to represent a problem to most users. (It should also be noted that this facility is very rarely used by adopters of the projection (Vujakovic, 1989))

The absence of a range of symbolization is equally surprising in a thematic atlas. The data is almost invariably displayed as choropleth or isarithmic maps. Peters sees the principle of one theme per map "... represented by simple grades of colour..." as enabling the user to more easily understand the data and compare it with the other maps. Unfortunately, the final product is rather monotonous and suffers from the problem of assuming homogeneity within the basic sub-divisions of the map in the case of the choropleths.

The choice of colours used appears to be arbitrary and tends to confound some of Peters' basic aims. For instance, the topics, 'Mineral Resources' and 'Industrial Products' each show 16 maps on a double page, however, different hues and tonal ranges are used for each one. This results in bias towards strongly coloured maps. The logic of Peters' 'objective' position would seem to demand the use of a single colour and tonal range.

It is clear that a single base map has been used throughout production of the thematic section, resulting in poor definition of lettering on the smaller scale maps following reduction.

The geographic content of the thematic section is interesting and varied. Topics chosen range from 'Natural Dangers' to 'The Status of Women'. Peters (1989) claims that "No interpretation or evaluation of information has..."
been undertaken..." in order not to detract from the user forming "... an objective and unprejudiced personal picture." (p.97).

A number of specific problems are readily apparent. The source(s) of the data used for the individual maps is never given; without this the readability of some of the maps must be in doubt. The atlas also states that where official figures are unavailable, the 'leading experts' in the various fields concerned where consulted. However, there is no indication of which maps this refers to or how this provides satisfactory data. The lack of dates for information shown on the maps is another major shortcoming, especially where rates of change are mapped. For instance, the maps of 'Population Growth' (p.131), 'Economic Growth' (pp.166-167) or 'Inflation' (pp.174-175) are meaningless unless the period concerned is stated.

Definitions for individual themes are not always clear. For example what is meant by 'Social Professions' (pp.168-169)? Other misleading maps include that entitled 'Urbanisation' (pp.160-161). Urbanisation is "The process of becoming urban." (Johnston, 1986). However, the map simply shows percentage of the population who live in cities (no date). This does not indicate whether the process of urbanisation is occurring, or rather the reverse trend of counter-urbanisation! Many of the themes seem to be arbitrarily chosen and in some cases pointless. Are two large maps really needed to show us that only the USSR and USA have achieved interplanetary and manned space flight? What is the logic of the animals included (or omitted) from the page of maps on 'Hunting'? Why are kangaroos included, but not whales or any of the 'big cats'?

iii) The Atlas

The publisher's claim that the atlas represents an 'epoch-making' advance in our overview of the world, and is the greatest single advance in cartography in over four hundred years, are far from confirmed.

The atlas has achieved certain of its authors' objectives. Peters is convinced that much of the effectiveness of atlases still comes from traditional forms of workmanship. His aim was to produce an effective merger of traditional and modern techniques in order to retain the "... good feeling of handling an old atlas." (Peters, pers. comm.). The craftsmanship, of the topographic section in particular, is not in dispute and does capture something of the beauty of the earth. However, both of the major sections are flawed. The problem can all be traced to the application (or not!) of the principles of the 'new cartography'. Peters dogmatically resists the use of any projection but his own in the thematic section. Yet in other circumstances he seems prepared to compromise his claim of 'universality' (that it is "... possible to unite in one grid system all the cartographic qualities which should be retained when converting the features from the rounded surface of a globe onto a flat map..." (Peters, 1983, p.82)). For example, by using of a different projection to show the polar regions. This latter example also undermines his claim that projections need no longer be taught ('Myth No.4').

The main lesson which this atlas provides, is one that cartographers and geographers have already learnt, that is that map production is about flexibility, adaptability and compromise. There is no one correct answer!

Conclusion

The Peters' 'new cartography' has generated a great deal of controversy. The publication of the Peters Atlas will add further fuel to the debate. His ideas have been accepted and adopted by a wide range of organisations, including various sections of the United Nations (eg. UNICEF). In the UK the main visible support is from the voluntary sector concerned with overseas development issues. The Peters phenomenon poses cartographers and geographers with a dilemma. Peters and his supporters have raised general awareness of the importance of maps in forming people's 'global image' to a degree which neither of these professions have managed in recent years. Yet the means by which he has done this are open to question. The atlas is evidence that his 'new cartography' is far from infallible in practice.

The reaction of the professions has been to vilify Peters, or to ignore him, in the hope that he may go away. This has not happened. It is time that his contribution (flawed as it may be) is recognised and used as a basis for constructive development, rather than continued defensive criticism.

Peters' sin is not a failure to defer to another cartographer in the naming of his projection, but his insistence that it represents the only, equitable, universally acceptable world map. His sin is not that he has questioned the bases of traditional cartography (correctly or not), but that he is seeking to replace it with his own dogmatic cult of the 'new cartography'.

Acknowledgements

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References


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