

Wieling, Martijn and John Nerbonne

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*John Nerbonne, Groningen (The Netherlands)*  
*Wilbert Heeringa, Amsterdam (The Netherlands)*

## 32. Linguistic atlases – traditional and modern

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### 1. Introduction

Without doubt, our understanding of human language and communication benefits from the geographical approach, especially the knowledge organized via maps and atlases. Given that institutes dedicated to the production of cartographic compendia have in the past been seen as linguistic laboratories (Stanforth 1971: 12), it should be clear that, in addition to recent developments, the traditions in linguistic cartography are well worth investigating. A resurgence in international atlas projects over recent decades has led to a strong (and continuing) interest in cartographic methodology. Above all, the computational handling of maps and atlases needs to be seen as a current focus of attention. But, due to the reassessments of historical data necessary for the analysis of language change, there is also a strong interest in the history of language cartography. While the first focal point is widely described in both papers and manuals, to date there has been no comprehensive cross-philological overview of the traditions in language mapping, especially one dedicated to the development of linguistic atlases (approaches are presented in, e.g., Thun 2000; Kirk 2001; Veith 2006; comprehensive but out of date is Pop 1950). This is unfortunate, considering that every cartographic work has a unique subjective dimension that is bound up with, first, the decisions of the individual authors and, second, the particular context of origin. Understanding how maps and atlases are organized is thus a precondition for their correct interpretation.

The production of linguistic maps became a relevant linguistic field in the nineteenth century, at which time we find an abrupt rise in the amount of cartographic work, making it possible to speak of the origin of the cartographic paradigm in linguistics. Right from the outset, atlases, not just maps, were seen as a productive tool in the pursuit of geolinguistic interests. The extent to which this was a part of a more general zeitgeist becomes clear when one reflects that geographers were also publishing the first thematic atlases at this time. Nevertheless – as will be shown – an atlas is not necessarily the

result of cartographic impulses. In these early times we find so-called “atlases” that were based on spatial but not cartographic information; at first approximation an atlas should thus be understood as *a phenomena-based compendium of spatial data of (at best) empirical provenience*. This is unusual, inasmuch as an atlas is currently defined as a systematic collection of maps (cf., e.g., Bollmann and Koch 2001: 39). But we also find similar approaches today, as with the modern linguistic atlases that are occasionally organized without any maps. This is related to the existence of different types of atlas organization and different historical stages of atlas production. But it also shows that there is to date still a problem in defining a linguistic atlas.

This article meets the challenge by arguing for a more comprehensive understanding of the initial phase of atlas cartography than has previously been adopted. Taking methodological progress into account, it becomes obvious – at least in the cases discussed – that there are stronger similarities of intent between the different approaches followed within map and atlas-based projects than has previously been conceded. Accordingly, section 2 highlights both the growing interest in atlases and the very earliest approaches which led to the creation of phenomenal maps. In addition, section 3 describes the development of the first linguistic atlases in Germany, Switzerland and France in the late nineteenth and early twentieth centuries. Taking these together with the work of their immediate successors, it becomes apparent that the most relevant issues in atlas cartography had already been worked through by the first half of the twentieth century, be they thematic structuring, onomasiological issues, the principles of map and data interpretation, the integration of extralinguistic factors, etc. Alongside this, section 4 shows that current atlases have set a new focus, directed not only at individual varieties but also at the communicative practices of their speakers. In this regard, the pluridimensional atlases are a promising tool for a more comprehensive interpretation of language in space. An expanded data basis is also emphasized in the design of current information systems, which extend well beyond traditional atlas design. The computational aspects involved in such systems are also discussed in section 4.

All together, it will be shown that there are chains of strong (mostly) personal connections which constitute lineages of tradition of which linguists are not always fully aware. But, more importantly, the main objective of this contribution is to demonstrate the progress, both ideological and methodological, which connects individual projects more closely than has previously been realized. Of course, it is not possible to offer a satisfying systematization of both chronology and methodology within the confines of a short essay, especially given that the current state of discussion is relatively meager. This contribution therefore highlights important aspects insofar as they are necessary to understand the central theme. For a more detailed treatment of the whole topic, readers are referred to the *Language Mapping* handbook in this series (Lameli, Kehrein and Rabanus, to appear). All of the maps and atlases mentioned in the explanations which follow have been included there (in the second volume) as examples.

## 2. Preliminary events

### 2.1. Linguistic maps

Cartography as a method for the description and explanation of spatial relations has a tradition that can be traced back to ancient times. Its subject is the illustration of a –

however it may be defined – geographic reality on a two-dimensional plane. Important epochs can be defined in terms of both the different stages in human conceptualization of the planet and the development of geometric techniques. Rather late in its history, a correlative approach that visually combines the terrestrial dimension with specific natural or social phenomena becomes apparent. Aside from ancient cartographic descriptions of space as affected by man (e.g., the *Tabula Peutingeriana* [c. 350 B.C.], or the so-called *mappae mundi* that represent the Christian view of the world during the Middle Ages, e.g., Erhard Etzlaub's *Romweg Map* of 1500), an explicitly thematic cartography does not clearly evolve until the eighteenth century. Then, however, we find a diversity of analytical approaches, in many cases based on quantitative measurements, as represented by Edmont Halley's *isogonic Map* (1701), which is commonly seen as one of the first truly thematic maps, if not the first. It is no coincidence that this map was intended for practical, i.e., naval purposes, namely calculation of the variation in the magnetic field around the Americas: maps confer practical benefits and are therefore used as instruments. But human spatial phenomena soon became more relevant for cartographers, such as, for instance, demographic questions arising from emergent statistics, and maps thus began to help interpret the conditions of human life. This also includes the spatial organization of language. However, it was not linguists but geographers who were the first scholars to demonstrate the regional distribution of languages or language phenomena (e.g., ten Kate 1723). It was Gottfried Hensel (1741) who produced early maps of linguistic variation that show, for instance, the different realizations of the Lord's Prayer in Europe or other details of the world's languages.

Although the focus so far has been on thematic cartography, it should not be forgotten that evidence of linguistic particularities is already found in the earliest geographical compendia. Thus, for example, in the commentary accompanying the map collection which forms part of his *Cosmographiae Universalis*, the German geographer Sebastian Münster mentions differences within the region of Silesia that make his essentially topographic map linguistically productive. He identifies the Oder River as a language border:

Utitur pro maiori parte lingua germanica. Ultra Oderam vero loquuntur Sclavonice, quae lingua communis est Bohemis, Polonis, Sclavis, id est, Illyrijs, Moscovitis, Lithvanis et multis alijs populis.

'In most parts the German language is used. On the other side of the Oder, however, Slavonic is spoken, which is the common language of Bohemians, Poles, Slavs, that is, Illyrians, Muscovites, Lithuanians and many other peoples.'

(Münster 1572 [1544]: Liber I, map 14 "slesiae descriptio"; my translation)

Nevertheless, an enduring desire for knowledge, including the investigation of language, first evolved during the Enlightenment in Europe. The Enlightenment focus on the human individual made both the subjectivity of the individual and the subjectivity of perception topics of scholarly discourse. This interest in the *res humana* led to a particular tenor of observation that also implicated language. Important consequences were the first empirical scientific attempts at collecting linguistic data within geography, thus helping to negotiate the theoretical-cum-reflective attitude that can be traced back to the early modern period. An empirical interest in the spatial dimension of language first appeared in nations with a marked linguistic heterogeneity, such as Germany, Italy, Russia or Switzerland, even if the actual aim of the early geographically based studies was not the production of maps, but rather the publication of the established linguistic

instrument of a lexicon (cf. Freudenberg 1965). Undoubtedly, the indirect global exploration of mass linguistic data commissioned by Catharine II of Russia is one of the most impressive examples. It led to the *Linguarum Totius Orbis Vocabularia comparativa*, realized by Simon Pallas (1777–1978 [1786–1789]).

It did not take long for the first linguistic atlases to emerge from such undertakings, especially taking into account that the tradition of thematic atlases began in the same period, with Carl Ritter's *Sechs Karten von Europa* (1806). According to Pop (1950: 18), a French sound atlas was being planned within the *Société Royale des Antiquaires* as early as 1823, although it was never completed. But in the same year, 1823, the first explicitly labeled (in the subtitle) *Sprachatlas* was published by Julius Klaproth. Its actual name is *Asia Polyglotta*, in reference to the multilingual relations in Asia which attracted scientific interest. From a current perspective, this work is anything but typical. In particular, it features lists of words ordered into tables according to certain language types, which, where necessary, are subdivided into individual roots (*Stämme*). At the end of the volume the reader finds a map where the linguistic information is put into geographical relation. However, on his map, Klaproth explicitly refers not to the listed languages but to their speakers ("Georgier, Kaukasier, Samojuden, Jeniseier, Ost-Finnen", etc.). In so doing, Klaproth employs a relevant ethnological argument, which may well have been of only minor importance to him. The argument reifies apparent parallels between languages and ethnic groups, e.g., the depicted linguistic proximity of peoples in "Hindustan" and "Persien". In this regard, the map contains additional information and also acknowledges the fact that language is dependent upon human carriers and does not exist autonomously. Further, it includes topographical details. Hence, the reader sees that the border between the "Indo-Germanen" and the "Tübeter" coincides with the "Himalaja", for instance. Thanks to the visual impressions it generates, which simultaneously abbreviate and broaden the linguistic information on offer, the map also serves as a potential starting point for linguistic deliberations. In fact, this proves helpful, since some groups of speakers, such as the Koreans or the Japanese, are not described in the preceding tables. But such rare cases aside, the map is also to be understood as a "register" which refers to the contents of the table and helps to interpret the regional picture in more depth.

This methodology is already identifiable in the early work of ten Kate (1723), which features a classification of European languages, together with textual explanations that also refer to the variation of specific phenomena. But above all, Klaproth's methodology is somewhat reminiscent of that of Johann Andreas Schmeller (1821), even if Schmeller's single map is not as elaborately illustrated, nor his work explicitly designated an atlas. Nonetheless, the organizational parallels to Klaproth alone mandate mentioning it in this context. Schmeller's objective was an exhaustive description of the dialects of the Kingdom of Bavaria via a comprehensive set of directly collected data. In order to achieve a geographical overview, he designed a coded map that enables the identification of individual language phenomena listed in a particular chapter of his monograph (1821: 427–432). Each code represents a dialect grouping, and the map is divided by lines into six individual groups at the first hierarchical level. The starting points for the areal structuration are primarily rivers, after which the dialect groups are named. Once again, based on the chapter about these dialect groupings, further information can be found in other parts of the book via an identifying number (1821: 31–426), where the reader finds a phonetic description of individual dialect phenomena. In such a way, Schmeller

develops a distinct dialect typology. Here too, the map functions like a register that gives access to linguistic information while at the same time also providing a spatial impression of the variability of language.

Against this background, the beginnings of language cartography can be seen to be characterized by rather similar approaches, with no single clear criterion for the use of the *atlas* label – which should not really be surprising, given that a tradition in thematic cartography had not yet been established. In contrast, it becomes quite clear that the terminology of the time is imprecise when we consider Adrien (or Adriano) Balbi's *Atlas ethnographique du globe* (1826), which, despite being called “atlas”, contains no cartographic material. What makes Balbi (who was a cartographer with an interest in ethnology, not a linguist like Klaproth) important from a linguistic point of view is the fact that he aimed to define human space, i. e., relations between peoples, in terms of the differences between the languages spoken by them (cf. the subtitle of his atlas: *ou Classification des peuples anciens et modernes, d'après leurs langues, précédé d'un discours sur l'utilité et l'importance de l'étude des langues appliquées à plusieurs branches des connaissances humaines*). As a consequence, his work is in effect a classification of languages, or rather a classification of groups of speakers.

In terms of the notion of maps and atlases within the linguistic context, it is important to note that Balbi included in his work a so-called “mappemonde” that is nothing more than a “tableau ethnographique” and thus not a cartographic work. At the end of his volume, the reader finds translations of individual words into the languages of the world as classified therein. It should be pointed out that the entire work is explicitly located within the context of Catherine II's project mentioned above; such early authors were obviously quite close to the lexicon projects of the time. For authors like Klaproth and Balbi, the most important defining criterion for an atlas was a reference to variability in space, not the presence of cartographic material. Consequently, their work occupies the middle ground between lexica and more modern atlases. One important difference between phenomena-based projects (like Klaproth's atlas) and cross-linguistic comparative lexica (like Catherine's project) lies in their macro and micro-structural organization. But possibly the most important difference is that maps and atlases aim to achieve a particular spatial structuring of language, while this is usually a precondition for lexica, not their objective.

## 2.2. Collections of maps

If, however, one defines an atlas from a contemporary perspective as a “systematic collection of maps in book format or as loose sheets for a specific goal and purpose” (Bollmann and Koch 2001: 39; my translation), then the initial phase of actual linguistic atlas cartography must be dated a little more recently. The most important starting point from this perspective is Bernardino Biondelli's *Atlante Linguistico d'Europa* of 1841. Here too, the focus is on the geographical relations between languages, or rather language families. Specific linguistic phenomena are also excluded from this work. The visual means of argumentation are color and lines, techniques it shares with virtually every thematic map from earlier periods. Above all, the use of (colored) lines proved to be a useful structuring method for evoking a spatial impression. When one considers, for instance, Bartolomeo Scultetus' *Lusatia Superior* map (1593) which displays the regional

difference between “deutsch” and “wendisch” (‘German’ vs. ‘Sorbian’) using colored lines, it can be claimed that this method has also been used for linguistic purposes from the very outset of modern cartography (cf. Thun 2000: 70–71).

In Biondelli’s case, the integration of further information via specific explanation is also important. In contrast to Klaproth, Biondelli’s individual maps are supplemented by additional information in the form of texts, not tables, albeit not as voluminous as Schmeller’s comments and lacking Klaproth’s detail about concrete realizations. It is nevertheless noteworthy that they convey, for instance, regional subgroupings or historical information not deducible from the map. It thus becomes obvious that, from the authors’ perspective, the map as such is not self-explanatory. In contrast, these authors feel an unquestionable need for commentary. This too is an element familiar from the first non-linguistic map collections, such as Sebastian Münster and his explanation of the Silesian map quoted above. Thus, bearing in mind that the initial nineteenth-century approaches shared an emphasis on the textual dimension and that the cartographic aspects gradually became more important, we can identify a line of development in the constitution of linguistic atlases, which – from a latter-day perspective – can be captured by at least two definitions distinguished from one another by a methodological advance. The first definition, which characterizes the first period up to and including the work of Balbi, conceives a linguistic atlas to be

- (1) a (non-lexicographic) collection of language data based on regional variation.

However, considering that Schmeller, whose work fits within this first definition, did not make use of the term *atlas*, it becomes obvious that the actual nature of language atlases was in practice rather unclear and dependent on individual aspects.

The second definition – which characterizes the later period starting more or less with Biondelli (Freudenberg [1965: 172] discusses an earlier unpublished project) – conceives of a linguistic atlas as

- (2) a collection of thematic maps showing the regional distribution of language.

What holds for both definitions/periods is, firstly, that the mapping techniques are linked to traditions in cartographic visualization well known to the cartographically adept authors. Secondly, with the inclusion of textual elements we find the use of techniques that transcend the illustration as such. At the same time, it is also obvious that linguistic atlases are from the outset explicitly bound to the concrete phenomena of spoken language (i. e., words), be it via maps or texts. If the comments are seen as an extension of the actual map information – and contrary to usual practice they should be – then there can be no doubt that the mapped registers included in the work of Klaproth or Schmeller – alongside earlier maps like Hensel’s, that remained unknown to nineteenth-century linguists – are the direct forerunners of later phenomena-based maps. That is, the distinction between maps of a language (*Sprachenkarten*), which detail the distribution of a language, and maps of linguistic phenomena (*Sprachkarten*), which describe concrete features (cf. Thun 2000: 71–73), is a theoretical simplification, although it is of practical benefit. For most of the authors mentioned, even if they produced maps of languages, the inherent information was phenomenal in nature. Of Schmeller at least, we know that he revised his early map to create a cartographic overview of linguistic

variants in the course of a later, commissioned work (Schmeller 1956 [1846]: 419). This interest in phenomena will be explored further in the following section, where the notion of “atlas” is that of the second definition.

### 2.3. The problem of phenomena

As shown, at the beginnings of linguistic cartography the kind of information that should properly form part of an atlas or a map seems to have been rather unclear. The simplest approach to the mapping of language is – at first glance – to show the regional distribution of a language as such. But given that ethnological constraints do not apply, this is only possible if comparable data that help to define a particular geographical distribution are available. This makes the linguistic-mapping approach exceptionally complicated. Even if scholars set out to create a phenomenal overview, the data – if available – is so voluminous that (the problem of transcription aside) it is not possible to present it all on one page. Scholars therefore attempt to classify their data. The register maps demonstrate that cartography was at first blush seen as a means of presenting such a linguistic classification. This makes it clear that, even if the dependent variable of the *geographical* approach was “linguistic item (sound, word, etc.)”, the dependent variable of the *cartographic* approach was, for methodological reasons, “language”. Nevertheless, the linguistic items were connected to the maps, via the textual explanations.

The general problem can best be understood by looking at other topics of thematic cartography. The aim of linguistic cartography is not substantially different from the objective of mapping “weather”, for instance. However, even the early cartographers (cf., e.g., Halley’s weather map from 1686) define weather via particular attributes such as barometric measures, barometric changes, wind, temperature, and so on. These attributes can then be individually presented on a single map. In linguistics, however, the *definiens* is often much more extensive and, moreover, there are fewer or no analytical instruments available that provide an intersubjective definition and classification of language “attributes”. It took some time before scholars like Schmeller managed to abandon their comprehensive approach and identified the possibility of using maps for the documentation of individual phenomena. When they did, the dependent variable was finally defined as “linguistic item” in linguistic cartography as well, and it made sense to assemble such individual maps into an atlas. As this orientation took hold in linguistics, the full potential of linguistic cartography was finally tapped.

### 2.4. A look at the zeitgeist

Finally, the scholarly resonance of this early stage needs to be addressed. Some of the projects mentioned are not well known to contemporary scholars; similarly, the pre-scientific maps of Hensel, ten Kate or Scultetus were also probably not known to the geolinguistic pioneers of the nineteenth century. But from 1800 on, most contemporary works in emergent linguistics rapidly became widely known after publication, at least within their individual philological traditions (although some occasionally sank rapidly into philological oblivion). The following anecdote gives a good impression of the situa-

tion at the time. In the Bavarian Academy of Science's journal, the *Gelehrte Anzeigen*, an anonymous review of Biondelli's atlas was published in 1842. With a vague reference to Balbi and following a detailed description of Biondelli's work, the enthusiastic writer makes it clear that linguistic cartography is only in the preliminary stages of development and that he therefore hopes Biondelli's atlas will act as an "effective admonition" ("wirksame Mahnung"; Anonymous 1842: 80) to go further. His enthusiasm is inspired not least by Biondelli's announcement of future volumes dedicated to the European languages and dialects. Biondelli's atlas is thus seen as an "excellent first attempt" ("erster großartiger Versuch"; Anonymous 1842: 80) on the way to an exhaustive description of geographical variation in language. Two years later, in 1844, the same anonymous reviewer compliments Šafařík and Bernhardi on their individual non-phenomenal language maps of Slavia (1842) and Germany (1843), respectively. But at the same time the reviewer points out that, in future, the main effort of linguistics should be pitched at the level of phenomena, not that of individual languages, which are heterogeneous sets of varieties and variants (Anonymous 1844: 573). In the reviewer's opinion, these three authors – Biondelli, Šafařík and Bernhardi – are nevertheless the founders of an explicitly linguistic cartography. This is remarkable in light of the identity of the reviewer in question: it is none other than the pioneer of empirically based (Bavarian) dialectology named above, Johann Andreas Schmeller, as becomes apparent from his voluminous diaries (Schmeller 1956 [1842]: 328). There is no mention of Klapproth in these, so it is possible (albeit unlikely) that Schmeller had failed to notice the Asian work. But most striking of all is the fact that Schmeller – in contrast to virtually every linguist since – obviously does not regard his own map from 1821 as one of the first dialect maps, a fact which serves to underline its abovementioned "register" function.

### 3. Methodological grounding

Linguistic atlases that are strictly confined to the documentation of linguistic phenomena have so far been portrayed as the result of developments in the history of language geography, and it is the German Georg Wenker and the Swiss Jules Gilliéron who independently realized such works in their earliest attempts in 1878 and 1880. Their projects are commonly seen as linguistic milestones and hence a large volume of literature on the basic principles guiding their work has been generated, so that little needs to be said here (for further information cf. Pop 1950; Werlen 1996: 436–444; Chambers and Trudgill 1998: 13–31). What makes their atlases interesting in the given context is the fact that they – not just metaphorically – enter uncharted territory and thereby set a new focus in geolinguistics. But conceptually the authors are not that far apart either; recall that both started out with the documentation of relatively small areas and ended up working with nations. Naturally, there were other highly creative scholars who addressed the phenomenal dimension of linguistic atlases, e.g., Fischer (1895). But together with their immediate successors, Wenker and Gilliéron developed the basic principles of language cartography that remain indispensable to this day. This is due not least to the sheer volume of their work and the central role it has played within the linguistic discourse of their time and since. This section therefore sets out to explore the underlying lines of their work which place them directly within the above-mentioned tradition.

### 3.1. Georg Wenker

Georg Wenker is renowned for his exploration of German dialects using a questionnaire of 40 standardized sentences that he distributed to German schools by mail. There, the questionnaire was translated into the individual dialects by pupils or teachers. Proceeding thus, Wenker collected information from over 45,000 locations. In a second step, this data was plotted by hand onto over 1,500 maps. His mapping procedure was refined in several stages within the project, in line with overall progress in linguistic cartography (cf. Knoop, Putschke and Wiegand 1982; Herrgen 2001).

In light of the above considerations (section 2.3), it is not surprising that Wenker's first cartographic work was a classification of the dialects around his homeland (Wenker 1877). In separating regions via borders – e.g., the “Grenze von Benrath” ‘border of Benrath’ – which he refers to in the text as lines – e.g., the “Benrath line” (*Benrather Linie*) – he employs explicitly cartographic arguments, thereby exhibiting a stronger emphasis on cartography in linguistics than did his forerunners. This also becomes apparent when we consider that Wenker used a geographically detailed and coherent base map. It is noteworthy that with this map Wenker also aimed to develop a classification dependent on various dialect group hierarchies. As with Schmeller (whose work was known to him), we thus find a cartographic structuring of language in space. But, in contrast to Schmeller, Wenker's map does not directly refer to textual elements, so that to a certain degree the map stands alone and can only be interpreted by reading the text *before* looking at the map. It should be kept in mind that Wenker's small volume is explicitly written for non-linguists (i. e., his informants) and thus addresses a different audience to Schmeller's monograph.

Things changed with Wenker's next undertaking. His *Sprachatlas der Rheinprovinz nördlich der Mosel und des Kreises Siegen* (1878) contains 25 printed base maps with colors that show the distribution of dialect sounds and forms added by hand. Developed as a demonstration of the validity of the methodology, it never reached the international book stores (only two copies existed). Nevertheless it has official status, since, as becomes clear from Wenker's letters, it was prepared for and considered by the German *Akademie der Wissenschaften* in the context of a proposal for further project funding. Indeed, this is the first real language atlas in the sense of a collection of phenomena-based maps. His methodological approach was to combine on one map several items that – from Wenker's point of view – stood in a certain linguistic relation to one another or showed similar regional distributions. Larger texts were obsolete and further information could be integrated into a corner of the map as a comment. An onomastic map and a topographic map complete the volume and offer further information to assist interpretation. But, more importantly, areas in which a specific word-bound element (sound, syllable, etc.) is realized in similar ways are indicated using contour lines. It is possible to speak here of *isoglosses* (Bielenstein 1892). The design of the maps is highly suggestive in the sense that Wenker shows correlations between different linguistic phenomena. Moreover, he demonstrates both the enormous heterogeneity of language and its underlying structure. This is an important characteristic of his early work since, in contrast to his later approaches, Wenker here presents a spatial analysis. By presenting his linguistic results, Wenker underlines the linguistic potential of his method.

His subsequent expansion of the project to northern Germany, published in part as the *Sprach-Atlas von Nord- und Mitteldeutschland* (1881), has a similar linguistic objec-

tive, even if the cartography has changed. It is less a presentation of data than a collection of interpretations (“Wiedergabe der Ergebnisse”, Wenker 1881: XI). Wenker’s work now became known to the academic world, where it was immediately welcomed with “unclouded pleasure, even with enthusiasm” (“mit ungetrübter Freude, ja mit Begeisterung”; Behaghel 1881: 434). Internationally, the phonetician Ellis considered the project “the greatest, the best-designed, and the best-executed attempt hitherto made to determine the peculiarities of local speech” (Ellis 1882: 30). Finally, a scientific gap seemed to have been partly filled, at least in Germany.

In the final step, which led to the *Sprachatlas des deutschen Reichs* (1889–1923; cf. <<http://www.diwa.info>>), Wenker’s principle objective and methodology shifted fundamentally once again. In his earlier approach, every map displayed a relatively homogeneous distribution of language. Many exceptions to the main spatial distribution were eliminated, which is why every map needs to be understood as a finished interpretation about linguistic space. The *Sprachatlas des deutschen Reichs* (along with its small, relatively unknown offshoot, the *Pronomina in Nordwestdeutschland*, Wenker 1886) is new in the sense that the maps explicitly show every detail of the data captured – and that for over 45,000 locations. This innovation entailed a stark change in the status of the maps. If they had previously been considered as analytical output, they were now seen as the instruments of future research. The increased diligence may also be due to the fact that the data transcribed were from laymen and thus required careful interpretation. Nevertheless, the linguistic potential of this approach is enormous, and it led to the recognition that, given the existence of sound laws, linguistic features – following Wenker – have their own unique spatial distribution, which can vary word for word.

This atlas is undoubtedly remarkable, from both a cartographic and a linguistic point of view. Each map that had been finished was officially sent to the Berlin State Library, where it was intended to be publicly available. Further, the maps were accompanied by commentary in the form of individual booklets (Wenker, to appear), which set out to document everything that might be of interest for further analysis. All the first drafts remained in Marburg, where Wenker worked. In the period which followed, this Marburg copy was virtually the only one in use (the commentaries remained unknown). What never became widely known is that the Berlin copy was created as a new type of atlas (cf. Lameli 2008a). The visitor to the library finds a paper map depicting monosyllabic words or root syllables. The word endings (e.g., sounds, suffixes) are mapped out on transparent paper. It thus becomes possible to overlay stem and suffix and to analyze the morphological distribution of related word components, for instance. Where linguistic atlases normally document paradigmatic issues, in this special case – by looking at different elements of form at the same time – the user can examine syntagmatic aspects. This technique further underlines the strongly word-based orientation. Wenker had already experimented with transparencies in the *Sprach-Atlas von Nord- und Mitteldeutschland* (Wenker 1881: XII), making a fundamental characteristic of atlas cartography obvious in the process: comparability.

### 3.2. Jules Gilliéron

The importance of comparability can also be found in the work of the Swiss linguist Gilliéron. His first atlas from 1880 is known as the *Petit Atlas phonétique du Valais roman (sud du Rhône)*. Gilliéron gathered the necessary data directly during a hike through the

southern Rhone valley, a region in the contact zone between Switzerland, Italy and Savoy where Romance varieties are spoken. The transcriptions are phonetically detailed and systemized on maps. This fundamental methodological distinction between Gilliéron (direct data collection) and Wenker (indirect data collection) is a stereotype in the history of linguistics. But in light of the historical period, it is also true that the two scholars were quite close in terms of their linguistic orientation. Gilliéron emphasizes that his work stands in the tradition of his teacher, Paul Meyer. Quoting Meyer, Gilliéron underlines to the goal of the atlas right at the opening of his introduction: “Faire en quelque sorte la géographie des caractères dialectaux bien plus que celle des dialectes” (Gilliéron [1880]: 7). This makes clear what Schmeller had already pointed out (cf. section 2.4). Because of a focus on the regularities of language, in this epoch only microlinguistic features like sounds seemed usable to obtain deeper insights.

But this atlas is also interesting from a cartographic point of view. The main method is based on color symbols. Different linguistic types are signified by different colors on a rather schematic map that features the national borders, the Rhone River and some villages. A particular location where a specific type was found is underlined in the appropriate color. Where necessary, the lines are broken or dotted, so that it becomes possible to multiply the number of symbols in use. This method was complicated by the fact that for financial reasons it was not possible to print the colors. Hence, like Wenker, who drafted onto preprinted base maps, Gilliéron was forced to draw the lines into every printed booklet by hand (Gilliéron [1880]: 7). Whether this work was really the first printed atlas is thus open to interpretation (cf., e.g., Thun 2000: 76). The principle of documentation (not analysis) aside, what is most striking – and this again brings Gilliéron ideologically close to Wenker – is the need for extralinguistic information. Gilliéron includes a wealth of information concerning topography, population, language history, unmapped linguistic items and – not least – linguistic similarities between the surveyed locations. In so doing, Gilliéron refers to the high degree of similarity between the dialects. Even if it was not explicitly so intended, this practice is typologically useful. This is remarkable since it is not a common topic in modern atlas cartography but is nevertheless related to later dialectometry to some extent (cf. Goebel 1984). In this regard, Gilliéron’s work illustrates the desire for a comprehensive and integrative description as well as the creativity of this early period.

Even if the influence of this early work has been rather selective, the next stage in Romance dialect geography, Gilliéron’s and Edmont’s *Atlas linguistique de la France* (*ALF*, 1902–1914), needs to be seen as the foundation of a linguistic tradition that made another important contribution to linguistic atlas cartography. The main objective of the *ALF* was to record the diatopic heterogeneity of the dialects in France (cf. Thun 2000: 76–80). According to Werlen (1996: 442), it should also be understood as a response to Wenker’s rather workaday methodology. In contrast to Wenker (whose work was known to Gilliéron), the method of data collection was a direct one: an investigator (Edmond Edmont) traveled all over France making narrow phonetic transcriptions in 639 locations. The instrumental character of the whole work is underlined by the cartographic organization. Each map shows the original transcripts for a specific linguistic variable. The map user’s first impression is that of a “spatial tableau”, i. e., topologically ordered words on a page. A more detailed spatial structuring, like that which Wenker intended, was not sought, which is why the *ALF* was able to rigorously pursue the documentation principle. In addition, a separate volume includes demographic data on

the informants and further comments on the transcriptions. It is highly interesting that the authors went as far as possible to provide all information about their material. This is true not only of the very detailed (in comparison to Wenker) description of the informants (e.g., profession, age, sex). The user also finds information on local variation in the *ALF* maps, in some cases information on the social differentiation of the variants used in a particular location, specified via comments like “chez les jeunes”, “chez certains individus”, “par les vieillards” (Gilliéron and Edmont 1902: 21). At this early stage, we thus already find a clear consideration of pluridimensional (i. e., social) aspects, which, as an aside, is also evident in the work of Wenker when he compares the language use of older and younger people using a language map in 1889 (cf. Lameli 2008b).

With regard to cartography, it also needs to be mentioned that by this stage a more precise base map was in use, showing the departments of France as well as the individual locations. The authors abandon the use of both colors and isoglosses. The latter might be attributable to the selection of only a small subset of potential locations, something the editors themselves saw as a “faible partie” (‘weak point’, Gilliéron and Edmont 1902: 3). But since, in contrast to Wenker, a phonetic transcription system was used, the documentation is as objective as was possible at the time. The user thus finds a sound data basis for linguistic analysis.

From a cartographic perspective, it is also remarkable that the authors combined various linguistic items onto one map. An example is Map 44 from the first *ALF* volume, where two realizations of the phrase *cette année* in different sentence positions (*Cette année, il y a eu beaucoup de fruit* vs. *La chaleur a été tardive, cette année*) are contrasted. The criticism might be raised here, as it was of Wenker (1878) for instance, that the authors have exceeded the principle of documentation by suggesting clear interpretations. But on the other hand, firstly – and in contrast to many modern maps which show combined phenomena – it is still clear which elements are mapped and, second, the user becomes sensitized to syntactic variation that is less obvious than phonetic variation. This highlights other distinctive features of the *ALF*, namely its inclusiveness with regard to linguistic sublevels (phonology, morphology, lexicon, syntax) on the one hand, and its orientation to the everyday life of its informants, which results in a concentration on specific semantic or lexical fields (e.g., personal names, plants), on the other. Both became important for subsequent projects.

### 3.3. Immediate successors

Obviously, Wenker’s investigations in Germany and Gilliéron’s in organizational terms parallel research in Switzerland and later France fundamentally influenced the scientific potential of dialect cartography in and of themselves. The most important factor might be that it was only through them that the empirical basis reached a (provisional) peak in terms of the quantity of data and its linguistic accuracy. In terms of theory, it could be concluded that Romance and German linguists stood in relatively close contact. For instance, the *Literaturblatt für germanische und romanische Philologie* founded in 1880 by Behaghel and Neumann, has played a significant role. However, in practice, collaborations in the field of language geography remain rare to this day, making it simpler to describe these lines of tradition separately.

Starting with the German tradition, the following national projects that are associated with the Marburg research center established in the context of Wenker's work should be mentioned. In Marburg, the *Sprachatlas des deutschen Reichs* was finally partially published as the *Deutscher Sprachatlas (DSA, 1927–1956)* by Ferdinand Wrede (a former employee of Wenker) and others. The final, methodologically substantiated description of the project is found in a separate handbook that forms part of the *DSA* (Mitzka 1952). Among other aspects, the analysis of the material gave rise to strategies for the interpretation of linguistic maps. Time and again, the editors found particular patterns of spatial distribution which they summarized into spatial types that are relevant for the interpretation of language change, for instance. In a sense, a summation of these is the classification of German dialects by Wiesinger (1970). In using the Wenker data in combination with more recent studies, Wiesinger demonstrates – from the perspective of a structuralist – the spatial structuring as a whole, together with the transition zones between larger dialect areas. All in all, this is not just a continuation of Wenker's work. When one remembers that Wenker started out with the classification of the Rhenish dialects, Wiesinger's synthesis also closes the circle. Historical developments meant that only then, 100 years after Wenker, were linguists able to analyze and interpret the cartographic information in more reliable ways and thus go beyond the documentation principle and develop analytical maps of high quality (for a general critique cf. Kirk 2001: 359–360).

Aside from this, the extralinguistic embedding of Wenker's data led to the elaboration of the subdiscipline of social linguistics (*Soziallinguistik*) under Wrede's direction, whose most important output is the *Deutsche Dialektgeographie* series (*DDG*; cf. Schrambke in this volume). Another step in the documentation of language across space can be seen in the various collections of sound recordings, such as the early recordings of Joseph Seemüller (Vienna) from 1905 on, or the collection of Wilhelm Doegen (Berlin) from 1909 on. The latter was carried out in collaboration with the second generation of researchers in Marburg, especially Wrede. Finally, a so-called “talking atlas” (*sprechender Atlas*) was published by the *Phonogrammarchiv* in Zurich in the context of the *SDS* (cf. below). Interestingly, its appearance plays back to the first (early) atlas definition mentioned above: this type of atlas has no maps (on the linguistic relevance of sound atlases, cf. Rabanus 2005; Schmidt and Herrgen to appear).

Completely different is the *Deutscher Wortatlas (DWA, Mitzka, Schmidt and Hildebrandt 1951–1980)*. This major project (22 volumes), initiated under Walther Mitzka, can be seen as the continuation of Wenker's national atlas and, as such, it was formally denominated as part of the *DSA* from volume 11 on. Whereas Wenker focused on sounds and forms, the *DWA* is dedicated to words. Its onomasiological goal is the exploration of the dialectal synonyms of various concepts. Basically, the *DWA* is oriented toward agricultural vocabulary. Given its lexical focus, phonological details were redundant and a phonetic transcription became superfluous. Hence, the indirect method already favored by Wenker was seen as adequate for the nationwide collection of data. Using a questionnaire of 200 items (mostly words plus a few sentences), Mitzka and his staff polled over 48,000 localities between 1939 and 1942, representing roughly a hundred percent of the German communes and nearly the same density as that reached by Wenker's project, with around one location for every fourteen square kilometers. Even though the data was not phonetically transcribed, the editors did not attempt a comprehensive classification of the individual records. At most, a (rather approximate) classification of lexical

records was made on the basis of a typological system of symbols. Further, the lexical types the authors considered to be most relevant are displayed using exemplars (*Leitformen*). Criticism of this atlas has been raised, that the extensive integration of original forms via geometric symbols in some cases cancels out or obscures the visual impression. On the other hand, prior to this, the systemic structuring of German dialect space was predicated virtually exclusively on the phonological and in parts the morphological dimension. Against this background, one of the most important merits of the *DWA* is to have demonstrated the lexical structuring of space and to have shown that, in Germany, lexical heterogeneity and lexical particularity is largely independent of phonological and morphological distribution patterns (cf. Hildebrandt 1987). This finding was only made possible by the inclusion of the original forms. In proceeding thus, the *DWA* reveals itself to be a continuation of the documentation principle. A comprehensive discussion of the *DWA* is given by Wiegand and Harras (1971).

In the Romance tradition, the (yet again) Swiss scholars Karl Jaberg and Jakob Jud are regarded as the immediate successors to the *ALF*. Both studied under Gilliéron and their *Sprach- und Sachatlas Italiens und der Südschweiz* (*AIS*, Jaberg and Jud 1928–1940) is strongly indebted to their teacher's methodology. Nearly every innovative aspect in the work of Gilliéron is rigorously worked out in the *AIS*, be it the transcription system, the typing of map entries, or the classification of the questionnaire's items and with it the semantic organization of the atlas maps. The principal motivation behind every organizational decision is strongly dependent upon the special requirements of the investigation area. This is what has made the atlas the standard reference work for many atlas projects in different philological traditions. For anyone interested in the development of language atlases, their introduction (Jaberg and Jud 1928) remains to this day one of the most important starting points. Against this background, the powerful influence of their work on later dialectology is no surprise.

Another immediate successor (that also became an inspiration for many other atlases) is the *Sprachatlas der deutschen Schweiz* (*SDS*, Hotzenköcherle et al. 1962–1997), initiated by Rudolf Hotzenköcherle in 1935. It is by no means coincidental that, once again, the extraordinarily heterogeneous linguistic situation in Switzerland was the focus. Hotzenköcherle, a former student of Jud's, set out to develop an atlas of a geographically restricted region ("Kleinraum atlas"), and in a sense thus closed the circle, bringing the Romance tradition back to the starting point of Gilliéron. Hotzenköcherle's focus on confined regions is a result of intensive discussion, especially within Romance philology (cf. the *Atlas linguistiques de la France par Régions* called for by Albert Dauzat in 1939). For direct data collection, the primary advantage of exploring small areas is the possibility of obtaining a dense network of survey locations. Where, for instance, the *ALF* polled around two percent and the *AIS* 5.5 percent of all possible communes, the *SDS* explored 33 percent. This leads to a density of one location for every 37 square kilometers in the case of the *SDS*, whereas one location in the *ALF* and the *AIS* represents 830 and 765 square kilometers, respectively. The distance between the individual survey locations averages five to seven kilometers in the *SDS*, whereas it is thirty kilometers for both the *ALF* and the *AIS* (Hotzenköcherle 1962: 86–87). This type of atlas – regionally restricted but with directly collected data and comprehensive coverage of linguistic phenomena – finally matched the masses of data collected in the indirect paradigm and, thanks to its inter-philological orientation, the *SDS* also influenced subsequent German atlas projects.

It is worth mentioning that once again the methodological aspect is highly prominent. On the general goals of linguistic atlases, Hotzenköcherle (1962: 1–2) summarizes his perspective as follows:

1. A linguistic atlas should present a cross-section of sounds, forms, words, etc. over space and time
2. Building on the spatial structure that results from (1), the goal should be a “language-internal” analysis leading to a spatial typology
3. Finally, the goal should be to relate the linguistic findings (whether of individual, structural or typological nature) to extralinguistic phenomena in space.

While (1) is an expression of the documentation principle, points (2) and (3) refer to application, and thus to the analytical potential of an atlas. In this, the *SDS* combines the evolving emphases in the history of linguistic cartography documented earlier with the findings of social linguistics. In concentrating on the German language, Hotzenköcherle liaises with German philology, as becomes obvious in the design of the atlas. Even though the data is phonologically valid in detail, the *SDS* uses symbols, not the original forms. By using (*grosso modo*) the German paradigm, the atlas offers its readers a clear spatial impression when looking at the mapped phenomena.

But Hotzenköcherle’s work should also be seen as a link between the two philologies in terms of its linguistic modeling. In this regard, his third goal is explicitly tied to the epochal work of Aubin, Frings and Müller (1926), which attempted to establish a strong correlation between linguistic and non-linguistic phenomena. As a result, the atlas is also designed to offer answers to folkloristic and social questions insofar as they implicate spatial relations. In the final instance, this is also a consequence of defining language as embedded within a comprehensive network of the specific conditions of human life. The *SDS* renders the need to integrate additional information and comments acute by linking language and linguistic geography to other human factors. Hence the *SDS* is extensively connected to other projects such as, e.g., the folkloristic *Atlas der schweizerischen Volkskunde* (Geiger et al. 1950–1995). From a methodological point of view, these cross-connections are highly interesting, since they offer possibilities that exceed the traditional potential of linguistic atlases. For instance, by linking the individual thematic maps to entries in the *Schweizerisches Idiotikon*, a semasiological approach that goes beyond the usual onomasiological orientation of atlases becomes possible. This maximizes the potential of an atlas, and, in terms of intent, is not that distant from the texts that have augmented atlases since the earliest times. At the same time it becomes obvious that linguistic atlases – in contrast to earlier views – are cohesive entities (cf. Hotzenköcherle’s first goal). Only the analysis of every thematic approach an atlas offers enables a complete understanding of the spatial structuring of language. This view represents a fundamental geolinguistic insight. It is the precondition for dialectometric approaches that are based on the analysis of complete atlases, for instance (e.g., Goebel 1984).

Another special feature of the *SDS* are the sound recordings that were collected into a sound library or “Phonotek”. From the outset, these recordings were intended to give a more complete impression of spoken language than a printed atlas can. But, unlike later projects, they were designed not to validate the phonetic transcriptions of the data, but as separate undertakings (1954–1959) which sought to supplement the documentation basis of the whole atlas. In this light, the *SDS* should also be seen as an early example of a sound atlas (cf. Schmidt and Herrgen to appear). In conclusion, it should

be pointed out that the methodological basis for virtually all activity in the field of linguistic or rather dialect atlases is elaborated (or at least considered) within the first approaches in the German and Romance philological traditions together with their immediate successors (up until the first half of the twentieth century):

- the awareness of the potential of linguistic atlases for smaller and larger regions
- both the documentation principle and analytical approaches
- the principles of data collection, data arrangement and display
- the thematic structuring and needs of atlases
- the organization of atlases as cohesive works in terms of thematic structuring, reference systems, symbolic representation, comment, etc.
- the treatment of both onomasiological and semasiological material in atlas cartography
- both paradigmatic and syntagmatic data processing in atlas cartography
- multimedial extensions of printed atlases
- the principles and possibilities of data interpretation
- extralinguistic linkages.

At the same time, the fundamentals of other aspects, like the pluridimensional paradigm, for instance, are elaborated largely outside of the philologies examined here.

#### 4. Further development

With the atlases mentioned so far, the pioneers of methodological progress in both German and Romance philology, at least up until the mid twentieth century, have been addressed. There are many other projects that have been broadly influenced by the individual undertakings, such as the regional atlases of the Marburg research center or the continuations of the *ALF* in many Romanic countries. Also worthy of mention are the recent regional atlases in Germany and Switzerland, which (their computer-based implementation aside) are of high empirical significance and methodological refinement but which generally represent relatively little cartographic progress. For more detail here, the reader is referred to the relevant articles in both this volume and the *Language Mapping* handbook (Lameli, Kehrein and Rabanus, to appear). Furthermore, it should of course be pointed out that there are numerous other approaches that aim to describe geographical variation in language via atlases besides those of the German and Romance schools. Above all, traditions in the English-speaking and Slavic countries and the Netherlands should be mentioned here. In this regard, the dialectometric approach which initially emerges solely from atlas contexts is highly relevant; it is a point of emphasis in the traditions that is not examined in further detail here. The most recent and probably most complete overview is that offered in the philological chapters in the *Language Mapping* handbook mentioned above. A solid overview can also be found in Chambers and Trudgill (1998: 13–31), Kirk (2001) or Veith (2006). For an exhaustive description of the pre-1950 scene, the reader is referred to Pop (1950).

In language cartography in recent years, the investigation of other linguistic levels, especially syntax and morphology, has become more prominent. In contrast, the prosodic dimension has remained a desideratum. The most important developments in more

recent atlas cartography, however, are related to two aspects: first – related to the internal design – there is the combination of linguistic and extralinguistic factors; second – related to the methodological realization – there is the increasing use of computers. These aspects are described separately.

#### 4.1. Pluridimensional orientation

It has been argued above that, to the extent that they were able to observe it, the authors of the *ALF* already tried to integrate social variation in language use. With Wenker too, the integration of linguistic variability has been pointed out. However, for these authors a social embedding of linguistic data was not the actual goal of their investigations. From a global perspective, to date the typical language atlas still focuses on just one variety as spoken by just one social type of informants (or social group). Hence, they follow a monodimensional approach, mostly concentrating on the language production of so-called NORMs: “non-mobile, older, rural males” (Chambers and Trudgill 1998: 29). But over the course of the twentieth century, the explication of socially conditioned linguistic variability also became an important and increasingly relevant topic of study. In geolinguistics, one result of this is the pluridimensional dialectology that has become more prominent in recent years. The goal of the pluridimensional orientation is to provide a more comprehensive picture of the social embedding of language. This is also a recognition of the importance of linguistic representativity (cf. Herrgen in this volume). In contrast to monodimensional atlases, their pluridimensional counterparts take account of a set of disparate factors, such as gender and age. Maps and atlases thus become the medium for different types of information which visually enables an understanding of language in space (cf. Mang and Wollin, to appear).

Jaberg and Jud’s *AIS*, which is marginally pluridimensional (Thun 2000: 81, footnote 33), aside, it is above all the work of Hans Kurath, as represented by the *Linguistic Atlas of New England* (*LANE*, Kurath et al. 1939–1943) that should be mentioned in this context. Given that Gilliéron’s pupil, Jud, was directly involved in the theoretical and methodological preparation of the atlas (cf. Kurath 1939: xii), there is a sense in which this is yet another continuation of the Romance paradigm in a different typological frame. Kurath – who displays a thorough knowledge of the history and methodology of language cartography (especially the German and Romance traditions) – aimed to describe both the regional and the social differentiation of language. Right from the beginning of the project, he considered different social groups of informants, classified into three levels of education (little formal education vs. better formal vs. superior education) and two generations (aged/old-fashioned vs. middle-aged/more modern; cf. Kurath 1939: 44), although these differences are not fully explored at every location (there are a total of 400 informants across 200 communities). Because informants’ backgrounds vary, at least one constant is needed: all informants must have grown up in the particular location under investigation. In the case in point, the local focus is relatively unique: in line with New England’s status as a former colony, special attention is paid to the history of the chosen communities, thus opening up a particular dimension of interpretative access (cf., e.g., Kurath 1939: Plate I). Hence, even though the actual language use is admittedly highly variable, there is still a strong awareness at individual locations of the historical dimension that gives rise to local types of language production. This is impor-

tant in that even where linguists address the heterogeneity of language enough constancy nonetheless remains (within the individual repertoires of the speakers of local dialects) to be able to define local types, both through time and geographically. In this regard, the pluridimensional approach illustrates particularly well the interest of linguistic atlas makers in documenting both differences and similarities in language use, even if the demonstration of differences usually has priority, thanks to its potential for structuring linguistic space (cf. also Gillieron's similarity approach, section 3.2). But a structural or gradual differentiation of language in geographical, social or situational terms only becomes possible through an (at least indirect) consideration of the constant elements of language. From a cartographic point of view, the implementation of pluridimensional data is rather complicated. The *LANE* displays the informants' realizations (narrow phonetic transcription), sorted according to the classification mentioned above, directly at the relevant location.

Explicitly a completion but also – from a pluridimensional point of view – an expansion of Kurath's work is the *Linguistic Atlas of the Gulf States (LAGS)*, Pederson 1968–1992) under the editorship of Pederson. The selection of informants is closely aligned with Kurath's approach (cf. Pedersen 1968: 16–23; 33–40). In addition, differences among (1) four generations are explored, further distinguished in terms of (2) regionality (communities, counties, parishes), (3) gender, (4) ethnicity (black vs. white), (5) informant types (old-fashioned and insular, modern and wordly [sic!], etc.). The *LAGS* thus indicates the enormous potential of the pluridimensional approach. In fact, the atlas reveals many interdependencies linking the individual variables. Cartographically, the *LAGS* tries to handle its wealth of material by presenting tables and maps dedicated to selected linguistic and nonlinguistic phenomena. A similar project in terms of the goal of documenting the language use of different social groups (differentiated by age) is the *Linguistic Atlas of the Seto Inland Sea (LAS)*, Fujiwara 1974).

Another approach to handling the variability of linguistic reality within an atlas project is evident in the methodology of the *Mittelrheinischer Sprachatlas (MRhSA)* by Bellmann, Herrgen and Schmidt (1994–2002; cf. Herrgen in this volume). There, the differences between two social groups (aged and sedentary vs. middle-aged and mobile) are displayed on colored contrast maps. However, due to the particular situation in Germany, the linguistic goal is different to that of the *LANE* and the *LAGS*. In Germany, education and age are not the most relevant factors determining the use of dialect features. More important is the amount of regular communication outside (or with people from outside) the home town. In line with this context, in which there is no real marked linguistic difference between sociolects and dialects, the authors of the *MRhSA* sought to find indicators of the vertical differentiation of language, i. e., on a spectrum between standard language and dialect (Bellmann 1994: 1–4) along which people can shift and switch up and down according to situational requirements. The primary goal is thus not the description of the social differentiation of language but the description of existing linguistic varieties (local dialects vs. regional dialects) using sociodemographic factors as extralinguistic correlates. Hence, this bidimensional approach provides fresh insights into the real state of language and language use. At the same time, it demonstrates language change in terms of the widespread replacement of local dialects by regional dialects. In a similar vein, other German pluridimensionally oriented projects are based on correlations between language features and social or contextual factors around and within major cities (cf., e.g., Mang 2004).

Certainly the most ambitious pluridimensional work is that conducted by Harald Thun in South America, focusing on Spanish, Portuguese and Guaraní (for an introduction cf. Thun 2000, to appear). The *Atlas lingüístico Diatópico y Diastrático del Uruguay* (Thun/Elizaincín 2000–; *ADDU*) can provide a suitable impression. Thun, who first proposed the term *pluridimensionality*, structures the atlas and the informants into different dimensions at particular sub-levels (cf. Thun 2000: 82):

1. diatopic
  - a. topostatic (constant domicile)
  - b. topodynamic (recently changed domicile)
2. diastratic (two social groups)
3. diagenerational (two age groups)
4. diasexual
5. diaphasic (three styles)
6. diareferential (contrast between answers and comments)
7. dialingual (Spanish vs. Portuguese)

A wide range of both linguistic and extralinguistic factors can thus be controlled and displayed on maps using a special symbolization system (quadrants). Once again, the linguistic goal is quite distinct. In contrast to the *LANE*, the *LAGS* and the *MRhSA*, the *ADDU* documents the communicative breadth of language. Even if it is not possible to explore all factors in the same depth and if in some locations only certain dimensions can be explored, this approach is at present the most comprehensive. Even compared to sociolinguistic studies that are often confined to a single location but explore multiple extralinguistic factors in depth, such a variety of controlled parameters is exceptional. According to Thun, the approach opens the way to linguistic atlases that display human language within communicative networks, and from a philological point of view this might well be the next stage in linguistic atlas cartography (cf. Thun 2000: 84–86). In this regard, Schmidt (to appear) argues that the possibility of such new methodological approaches is necessarily tied to progress in the technical means of realization. The keyword here is “linguistic dynamics”, and its analysis is dependent upon the geographic orientation, inextricably tied firstly to linguistic atlases and secondly to their digital availability.

## 4.2. Computerization

The computerization of linguistic cartography has generated a wide and international variety of undertakings (cf., e.g., Kirk 2001: 351–353). During the 1970s, the first projects to use computer methods in linguistic cartography – especially in the planning of atlases – emerged, like the *Computer Developed Linguistic Atlas of England (CLAE)*, Viereck and Ramisch 1991–1997), the *Atlas Linguarum Europae (ALE)*, Alinei, Viereck and Weijnen 1983) and the *Kleiner Deutscher Sprachatlas (KDSA)*, Veith, Putschke and Hummel 1984–1999). More recently, however, virtually every atlas is realized using computers. A differentiation is possible by looking at the specific uses to which computers are put and their potential value for language documentation and linguistic analysis. Whereas some projects use specific graphics software for the design of atlas maps (e.g.,

in Germany, most volumes of the *Bayerischer Sprachatlas* series; *BSA*), others develop tailor-made computer systems to answer particular linguistic questions (e.g., the *Digital Wenker Atlas* [*DiWA*], Schmidt and Herrgen 2001–2009). While some projects view a digital version as a worthwhile supplement to an edited book (e.g., the *World Atlas of Language Structures* [*WALS*], Haspelmath et al. 2008), others take the other tack by first publishing their databases on the internet as a means of linguistic analysis before producing printed atlas volumes of representative maps (e.g., the *Syntactische Atlas van de Nederlandse Dialecten* [*SAND*], Barbiers et al. 2005). Another distinction is possible in terms of how the digital atlases are made available (desktop vs. internet), and so on.

A special case is the *Atlas of North American English* (*ANAE*) by Labov, Ash and Boberg (2006). While phenomenal atlases – especially sound-oriented atlases – are usually based on phonetic transcriptions made by specially trained investigators, the *ANAE* places its emphasis on acoustic analysis and thus sets a new cornerstone in atlas cartography. Significantly, in addition to the computer-based telephone interviews, the encoding of spoken language is in many cases purely computer dependent. In total, 439 of the 805 recorded interviews are analyzed with regard to the details of the formants they exhibit. The use of an automatic readout of the acoustic speech signal is a special case of computerization in geolinguistics which indicates some of the potential of the digital era (for a critique cf. Künzel 2001).

However, currently, the most common procedure is to digitize the collected data and then analyze it statistically. Even though computer-based methods yield an additional benefit, the data continues to be explored, encoded and mostly classified using traditional techniques. Many atlas projects are currently refurbishing their (sometimes historical) data by providing digital editions with enhanced functions. Occasionally such work is conducted within larger organizational frames, as with the North American atlases (e.g., the *Linguistic Atlas of the Middle and South Atlantic States* [*LAMSAS*], cf. Kretzschmar and Schneider 1996) or the Bavarian atlases (e.g., the *Bavarian Database of Dialects* [*BAYDAT*], cf. Zimmermann 2007). The fact that the *LAMSAS* gave rise to an *Atlas by the Numbers* (Kretzschmar and Schneider 1996) shows that in the meantime, and in no small part due to computer techniques, the documentation principle – which pioneers needed time to become aware of – also enables promising future analytical approaches. At the same time, the digitization of data makes it possible to cross-connect projects, although this proves rather difficult and complicated in detail. The idea of linking data is not new and it is not necessarily bound to the computerization of linguistics. The example of the print-based *SDS*, with its attempt to link information from lexica and other sources, already demonstrates the intent to link linguistic material of differing provenience. But the development of modern information systems compels linguistic data linking. In the long term, this will dissolve the at present rather clear distinctions between dictionaries, atlases, sound archives, bibliographies, etc. (cf. Moulin in this volume). Whether such information systems can still be considered atlases is a question of definition that has not been raised. At any rate, they also serve the documentation principle.

One of the most ambitious undertakings in this regard is the recently launched *regionalsprache.de* project (REDE; cf. <<http://www.regionalsprache.de>>) at the Marburg research center. Among other things (e.g., the collection of fresh linguistic data), REDE aims to digitize a wide range of German language atlases and bring them together via the internet along with numerous sound files and bibliographic information (cf. in this

regard the design of *DiWA* as well). Further, in collaboration with other institutes and individual scholars, a cross-connection with other information sources (e.g., dictionaries, questionnaires, alignments, etc.) will be implemented. Due to the vast mass of data thus pooled, quantitative analyses must be implemented, and a strong analytical orientation to the goals of information systems (cf. in this regard the goals of the *SDS*) is a result. From a theoretical point of view the potential of the cross-connection is enormous, and in this specific case, the analysis of linked language data from different periods in the history of linguistics has given rise to the theoretical framework of the linguistic dynamics approach (cf. Schmidt in this volume).

Finally, it should be pointed out that, thanks to GIS technology, cartographic quality in linguistics has improved in recent years. Whereas in the 1990s and the beginning of the twenty-first century, linguists often still designed their atlases on their own (leading to some problematic results that can be summarized as the “CorelDraw syndrome”), in future – via web mapping, etc. (e.g., Nickel 2008) – both the computational basis and collaborations within and across philologies seem set to become more relevant than ever. Assuming that the cross-linking of data and information systems can be achieved, the result will be an extremely powerful instrument that could well elevate linguistics to another analytical sphere. Nevertheless such intentions are beset with both fundamental and more specific problems. One technical and organizational issue is the problem of how to handle cross-connectivity. A problem of interpretation is the high degree of suggestiveness maps and cartographic instruments possess: steps need to be taken to ensure that the user of the linguistic information system is afforded the support of comparable data and data types. At the same time, the user must be aware of the interpretative traps that are an inevitable consequence of the availability of mass data. Hence, as a future challenge, geolinguists (and others) have the difficult task of ensuring that students and scholars are adequately educated. This, however, is essentially no different to the situations faced and generated by the pioneers described above.

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*Alfred Lameli, Marburg (Germany)*

### 33. Dialect dictionaries – traditional and modern

1. Introduction
2. Words in space: The origins of dialect-lexicographic endeavor
3. Mapping the German dialect dictionaries: The German language dialect dictionary landscape
4. From index cards to proofs: Data analysis and presentation of results
5. Electronic dialect lexicography and complex lexicographic information systems
6. References

#### 1. Introduction

The following article is intended as an overview of the most significant phases in the development of dialect lexicography and of its methods of data analysis and presentation of results. Because space is limited and in light of the current state of research, where a systematic review or comparison of the dialect-lexicographic traditions in individual languages is not yet possible, the German language is taken as an example. However, at times other languages and related philological traditions are referred to and potential links are mentioned. The need for a typological, cross-linguistic examination of dialect lexicography in (and beyond) the European context is made even more apparent by the absence of an appropriate article in the HSK “Dictionaries” handbook. There, the topic of “dialect dictionaries” is dealt with on the basis of the situation in French (Rézeau 1990).

#### 2. Words in space: The origins of dialect-lexicographic endeavor

In the history of how modern European languages are written, collections of words can already be found from the Early Middle Ages, in the form of glossaries for Latin texts or specialized monolingual glossaries for example. These collections can definitely be