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Ptolemy - the first UNGEGN toponymist

Paper submitted by Israel**

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Introduction

We are approaching the end of the second millenium. Let us go back to the beginning of the first, and even before that, to a time when Greek Alexandria was the cultural capital of the world. The present paper will build a bridge between antiquity and the present. But chiefly it will deal with conditions and developments within a shorter span of time, and even with the work of a single person – Klaudios Ptolemaios, or Ptolemy, as he is usually called in English.

I wish to stress from the outset that when using the word 'world' in this context, reference is made to the so-called western world; East Asia had its own centres of culture and learning, which are often neglected by historians in the West, mainly because of a lack of information. But this lack of knowledge seems to be mutual.

Definition of an Expert on Geographical Names

What constitutes a U.N. Expert on Geographical Names? He - or she - should, of course, be a good toponymist, i.e. a person dealing proficiently with geographical names and their standardization. Experience in 'active' geography would be expected, as well as a knowledge of linguistics and an interest in history; and a very important component in his or her training would be a solid background in cartography. Furthermore, administrative experience would be of value, especially in the handling of both data and people. And why all these qualifications? Because a member of UNGEGN is required to do a multi-facetted job. He (and, to make this presentation gender-independent, the 'she' will henceforth be implied) must treat and standardize toponyms. This term is derived from the Greek word *τόπος*, *topos*, a place, and a place in this connection is, of course, identical with a geographical place, at least if we are considering planet Earth. The second constituent of the term, *onyma*, *ὄνυμα*, also onoma, is a name. Here we enter the realm of linguistics, the study of language – but this has a much greater impact than merely furnishing this technical term. So let us open this discourse by briefly reviewing the qualifications of a model UNGEGN member in these different fields, and then examine whether and to what extent they applied to Ptolemy – the subject of our paper.

Geographical knowledge comes handy when one has to take into consideration the physical and human conditions under which a name is born, or exists, or changes. Names in southern Africa have to be considered differently from those in the constituent parts of the Commonwealth of Independent Countries, formerly the USSR, or from names which evolve in New Zealand.

Linguistics and phonetics must be applied in such a wide range of conditions and situations that it is difficult to ennumerate them all. Let us just consider the problems encountered in the transformation of geographical names from one language into another through translation and by exonymization (we shall return to this term later); or in the conversion from one script or writing system into another via phonetic and often popular transcription or more "scientific" and reversible transliteration. A particular

case here is romanization: the conversion of the graphic symbols of a "source" script into Roman characters. The source script may be in one of the three basic writing systems: logographic such as Chinese and Japanese Kanji; syllabic such as Amharic, Japanese Kana and Eskimo Inuktitut; or alphabetic e.g. Cyrillic and Greek, or Arabic, Hebrew and Persian. The latter three are classified under the label "defective", because in writing them one can omit the vowels so that they can be written with consonants only, or nearly only, and no harm done. And there is also the case of Korean, which is composed of alphabetic letters arranged graphically in syllabic units. Of course there are many others.

A sense of history is of importance because many geographical names resemble living organisms: they are born, but often do not remain constant and, through time, change in form, whether spoken, written or both. In the end some of them die, but if they are lucky they may even be resurrected – as are many biblical place names in present-day Israel. In order to be able to select one particular name for a given topographic feature from among a number of existing ones, some of them historical or traditional, others perhaps in simultaneous and contemporary use, all the above qualifications must be brought to bear when toponymic considerations are applied in order to decide which name or names should be regarded as standardized or even official. Perhaps an order of precedence must be established, just like among people of different rank, social status or income! This is a situation found in some multilingual countries such as Belgium, Switzerland and South Africa.

Furthermore, geographical names are no aspatial objects: they exist in four-dimensional space. Each named feature on Earth has three geometrical coordinates and one of time. The time coordinate is simply the date (or the period) when a name is, or was, in use. The geometrical coordinates (i.e. those measured on the surface of γῆ, gé – the Earth in Greek – can be ordinary geographical ones of latitude and longitude, or the X-Y coordinates of a plane-rectangular framework such as the UTM grid or any other national or local coordinate net. To these must be added elevation, i.e. height referred to mean sea level. An understanding of the basic concepts of geodesy is thus required.

Why was cartography mentioned as a further requirement? Cartography, from the Greek χάρτης, chartis, a sheet of paper, is the science, technology and art of geographical maps. This interdisciplinary discipline extends today from collecting material in the form of geographically-referenced data – including terrestrial surveying, aerial photography and remote sensing from artificial satellites, as well as gathering thematic information on a multitude of topics – through editing and graphic designing, to the display of these data (whether by manual or by computerized methods) in the form of visible maps (or tactile ones, for blind people). Furthermore, cartography covers research into the history of maps and mapping. This definition is not identical with the one adopted by the International Cartographic Association (of which I was a formulating member), but it represents its spirit.
Geographical names can be stored in different ways and on different media, the most important and prevalent ones being name lists such as name indexes and gazetteers (this is "biblio-graphic" storage, whether printed or saved on a digital computer medium) – and maps. The latter form, "carto-graphic" storage, has the advantage that the placement of a name in a map is analogous (at least in two dimensions, X and Y, or latitude and longitude) to the location of the respective geographical feature on the globe. A name printed in a map can, even by the form in which it is presented in the map – font (i.e. typeface and size), capitalization, colour, direction, curveosity and spacing – impart to the reader a wealth of information about the geographical item represented by the name. The toponymist inserting a name in a map must be conversant with the relevant cartographic procedures and methods in order to correctly encode this information graphically and convey it to the map reader.

So toponymy – the theory and practice of dealing with geographical names, including their standardization, is an interdisciplinary topic. If one takes a closer look at it one finds that it covers many cultural fields such as literature, politics and even music. But chiefly it involves – directly or indirectly – the science of location, because unlike any other proper noun, whether of a thing or a person – a toponym or

geographical name is bound to a fixed place on Earth or on a planet or natural satellite. This is why onomastics, the science of names in general, regards toponymy as one of its sub-disciplines [1].

The Scientific Background

After this rather lengthy introduction, let us go back in mind to antiquity. In the last pre-Christian centuries Alexandria in Egypt gradually inherited from Greece the position of leading cultural metropolis. And although it lay on the other side of the Mediterranean Sea, at the mouth of the westernmost arm of the Nile delta, it had also inherited the Greek language. No wonder; after all it had been founded by Alexander the Great – to serve both as a Greek cultural centre in Egypt and as a naval base. One of the city's most important institutions, if not the preeminent one, was the *museon*, the seat of the muses or rather that of their dedicated followers – the philosophers, historians, astronomers, geometers, mathematicians and other humanists and scientists. Foremost in this research institute, the *museon*, was the library, which in time became the greatest and mostextensive in the world until it was burnt down during the civil war in the third century. Annexed to the library were studies and working rooms where the selected fortunate scholars could conduct their studies and writing. Among them were well-known figures such as Euklides, Eratosthenes, Hipparchus, Poseidonius and many others. On some of them we now have to focus our review.

Alexandria was also a world centre of learning of different religions. It is said that St. Mark made his first convert to Christianity there in ca.AD 45. Our own Bible, the Old Testament, was translated there from Hebrew into Greek as the Septuaginta, called thus after the 70 Jewish scholars who, each in his isolated cell, performed the translations – all identical.

The Scientific Background

Already in the third century BC Eratosthenes of Alexandria had made an unprecedented calculation for the circumference of the Earth which had a profound impact on the understanding of cosmology and geography. He arrived at a value of some 250,000 stadia or some 45,000 km. Taking into account the primitive measuring instruments for distances and angles in his time, this was a surprisingly accurate result. Today we know that Eratosthenes was lucky; some of his errors were distributive and cancelled each other out. He also demanded that positions on the Earth be measurable and fixed. Hipparchus, in the second century BC, proposed that such locations be determined by astronomical observations, and suggested a prime or zero meridian in the Fortunatae insulae, today's Islas Canarias or Canary Islands, regarded by the Greeks as the westernmost end of the known Earth.

Some 100 years later Poseidonius who lived between approximately 135 and 50 BC also calculated the size of the Earth by a different method, trying to improve upon his predecessor's result. However, he arrived at a value of some 180,000 stadia or about 32,400 km only which, as we know today, was much too small. The impact of this second measurement on Ptolemy's work in geography and on the history of geographical discoveries will be mentioned later.

Into this learned atmosphere came Ptolemy. While we know much about his work, most of which has been preserved to this day, we know very little about his person. It is probably true to say that his activity as a collector, compiler and editor was of even greater significance than his activity as an originator. But this might lead to underestimating his wide-ranging talents. I wish to evaluate some of his work and its results without going too deeply into the controversial question of what was really his own contribution and what was influenced by him and probably – or at least perhaps – performed by others. There are so many editions of his work; in many cases if not in most the later editor added some of his own ideas or updated information, whether correct or wrong, and so a brief paper cannot cover them all. I shall simply try to summarize, and stress what seems to me, as a cartographer and toponymist,

as the most important aspects of his wide-ranging work which was one of the most notable and influential ever to be performed. So before describing Ptolemy's work in geography, cartography and toponymy, I must devote some space to his achievements in other spheres of science, mainly those that have a direct bearing on his accomplishments in the earth sciences.

Ptolemy's greatest acclaim to fame was his work in astronomy which came to be known both in the East and in the West as the Almagest. But I will not further describe this masterpiece. Suffice it to say that astronomy has a strong bearing on the science of location which lies at the base of cartography.

Ptolemy was a mathematician, well trained in both branches of contemporary mathematical science, namely geometry and arithmetic. Here he certainly did important original work, as demonstrated in his book 'Analemma', which was written chiefly as a guide to constructing sun-dials. In it he treated the projection of three-dimensional bodies, chiefly points on the celestial sphere, onto three planes perpendicular to each other. This, in effect, was useful also in his geographical studies, because points on the terrestrial sphere, the surface of the Earth, are geometrically analogous to those on the imaginary heavenly globe – if we disregard the irregularity of the Earth's surface, that is, the relief of mountains and valleys. In fact, it is the basis of cartographic projections which, after all, are also based on this restrictive assumption. Altitudes are then added onto the plane projection. This latter step was adopted, also in antiquity, in Ptolemy's work, in the forms of names of mountains and valleys. So here we see the importance of geographical names in depicting the physical landscape and its surface relief. Only about a millenium and a half later surface relief was represented, or rather elaborated, by numbers – the two modes, one verbal and one numerical, being non-terrain analogous and inconsistent with the graphic analogous depiction by plane projections. Contour lines used for showing relief were again conceived somewhat later.

In another work, the 'Planisphaerium', he dealt with the projections of three-dimensional bodies onto a plane, using as a focal point an extreme point of the body. Applied to the graphic representation of the Earth, this is the Stereographic projection, usually centred on the South or the North Pole. It seems that this method had already been known before the time of Ptolemy, but it was perfected and formalized by him. The Stereographic projection is still in widespread use today, especially for the circumpolar regions of the Arctic and the Antarctic. And not only is it used in small-scale atlas maps; it serves as the complement to the well-known UTM or Universal Transverse Mercator Projection for the polar areas where the cylindrical transverse UTM projection is impractical.

Ptolemy also did work in physics. Hipparchus in the 2nd century BC had demanded that location on Earth be established by astronomical observations. Ptolemy wrote a five-part work on optics, the 'Optica', in which he treated, for the first time, not only the general problem of the refraction of light on passing from one medium into another, but of refraction of the light from stars at different altitudes. This was, and still is, of great importance in astronomical observations such as those needed for determining the position of points on earth – both in 'static' cartography and in 'dynamic' navigation. Only lately have satellite-based global positioning systems (GPS) made the determination of location independent of optical observations.

The *Geographia*

I now come to the second great and extensive work on which Ptolemy's fame rests, second in importance only to the Almagest, and it, too, had far-reaching implications. This is the 'Geographiki Yphigisis' or 'Guide to the description of the Earth', which became later known simply as the 'Geographia', and later still as the 'Cosmographia'. Alexandrine science had accepted the Greek image of a spherical Earth, but had still to struggle with the three question of (a) its extent, or rather that of its populated regions; (b) its graphic representation on a plane surface; and (c) the placement of thousands of geographical

names. In other words, the construction of maps had to be solved. In the *Geographia*, Ptolemy adressed all three issues.

Some time before him, Marinus of Tyre, also working in Alexandria, and being aware that astronomical observations were in many instances crude, imprecise and even outright wrong especially as regards longitude, asked that map makers collect their base material from travellers such as seamen and traders, and not necessarily in astronomical terms. Ptolemy was critical of Marinus, but used both types of sources. Some geographical names and other data provided by travellers are unidentifiable today. This does not necessarily imply that they were fictitious: in many cases they had been distorted by Ptolemy's informants. In this context one is reminded of another famous book, namely Antoine de St. Exupéry's *The Little Prince* [2]. There we find a pompous geographer declaring that in writing his books he never leaves his desk but relies on informers. However, these must be reputable people, because if, for example, they are drinkers, they might report two mountains where there is only one!

In the 14th and 15th century, under the pressure of the Muslim Ottomans, an emigration wave from Byzantium to Italy resulted, with Greek manuscripts constituting an important export commodity. There are various accounts of how and when the *Geographia* reached Italy where it was translated into Latin, and much has been written on this subject. But while there is an extensive literature concerning the way the *Geographia* travelled from Byzantium to Italy, there exists no reference on how the Greek original had travelled from its birthplace in Alexandria to Byzantium (where the Arabs copied and translated it in the early 9th century).

In the translation, the name 'Geographia' in the title of the work was changed to 'Cosmographia'. Jacopo Angelo, one of the original translators, explained this change by saying that the Roman Plinius (Plini) called works describing the Earth by the Greek term cosmographia, and their authors cosmographers. In time the work became known by both names – the Geographia or Cosmographia of Ptolemy. I shall refer to it as the *Geographia*.

One can distinguish between two distinct parts of the *Geographia* as it is known to us, namely the text, originally in Greek, and the maps. Whereas the Greek text (whether the true original one, or one somewhat modified) was preserved and brought from Byzantium to Italy, being translated there into Latin – this text was not accompanied by original maps. Any maps which Ptolemy himself may have drawn were lost. We shall presently see how they were reconstructed during the Renaissance purely with the help of geographical names, and then reproduced continuously with geographical improvements (which today one would call updating), until about 1730.

The first printed edition with a definite date was produced in 1475 in Vicenza (Italy), and had only the text and not the maps. There are two theories about how all editions of the *Geographia* since 1477 had maps. One theory holds that there had been in existence in the 14th-15th century a prototype map, or rather a series of prototype maps, copied from an original which was lost in antiquity. The other postulates a reconstruction of the maps in the late Middle Ages from Ptolemy's original data by a method which will be described below. At any rate, from 1477 all printed editions included maps, in two versions: the A-version with one world map and 26 regional maps, and the B-version with 64, i.e. with many later additions.

Three Aspects of Ptolemy's Geographical work

I recognize three aspects of Ptolemy's integrative work as reflected in the *Geographia*: the geographical, the cartographic and the toponymic. Before him there had been a separation or division between verbal text describing geographical features on the one hand, including all geographical names, and formalized

or symbolized graphics, that is to say maps, on the other. The writings of Herodotus and Thukydides, for example, can illustrate this.

So first: Ptolemy's work as a geographer. In evaluating this we must exercise some care. We do not know much, if anything at all, about his travels. Being librarian at Alexandria he was, so to speak, an armchair geographer. This is not at all meant to detract from the merit and significance of his achievements. As mentioned before, he relied chiefly on geographical information supplied to him by others. That most of his informants (some of whom must have lived before his time) were reliable can be seen by just looking at the information contained in the *Geographia*, and especially at the maps which were based on it and added later. In his introduction to the *Geographia*, and also in the name lists, he makes a distinction based on the reliability of the position given for his data, dividing them in this respect into two categories. The first includes places well-known and well-documented, whereas the second has places of secondary importance. The geographical coordinates for these were, apparently, not measured locally by astronomical observation, but taken from their location in the maps. There is, quite naturally, a sort of radial or excentric decay function in the maps: the farther one gets from the heartland of western civilization – southern Europe, northern Africa and western Asia, the lower the accuracy of the maps if compared with the hindsight of our present-day knowledge. Here one can see one difference between geography and astronomy. You can observe most of the visible heavens sitting in a chair and watching the stars go by, at least for one hemisphere. Not so in geography; here one has either to travel, or, if one does not, have reliable sources who do. This was the distinction between St. Exupéry's static geographer and the interstellar travelling Little Prince. We have no idea who Ptolemy's informants were, but, as I said, on the whole they were not drinkers.

How can one judge the accuracy and reliability of Ptolemy's maps if they are missing? Here, a few words must be said about the composition of the text of the *Geographia*. It consisted of 8 parts or books. In Book I, with 24 chapters, Ptolemy provides his definition of geography, methods of collecting data and their evaluation, followed by a detailed critique of the map-making methods proposed by Marinus of Tyre and finally his own methods of portraying the Earth on a globe and on a plane surface. The latter are today known as map projections.

Eight Thousand Geographical Names

Books II to VII of the *Geographia* include a list of some 8,100 locations around the known or inhabited world. It must be said that a large part of this world was based on conjecture or even imagination. Thus, in the world map, attributed by some writers to Agathodaemon of Alexandria, Africa was connected to East Asia approximately along the equator by a region carrying in later Renaissance editions the Latin inscription 'Terra incognita secundum Ptolemaeum': unknown land, according to Ptolemy.

But it is this extensive list of locations which enabled two tasks to be performed. Firstly, it led to the reconstruction of his maps in the 15th century, as mentioned above. And secondly it enables one to evaluate the accuracy of the information on which he based his work. Of course, for both these tasks to be performed, a geographical framework had to be devised in which the positions could be quantitatively defined. And this framework too was provided by Ptolemy. This framework was the geographical graticule, the name given to the net of imaginary parallels of latitude and the meridians of longitude. Today we measure both latitude and longitude in terms of angles measured from the centre of the Earth– northwards and southwards from the intrinsical or natural line of the equator for latitude, and westwards and eastwards from an arbitrary meridian for longitude. But Ptolemy at least at first used for his latitude of a point so-called solstitial hours, that is to say, the number of hours of daylight on the longest day of the year at the respective point. This could be measured quite accurately, as could angular measure which replaced it already in the name list of the *Geographia*. and is used still today. But determining longitude proved (indeed until quite recently) to be a much more difficult undertaking. Ptolemy, again at first, used the

distance east or west from a base or prime meridian through Alexandria, measured in hours, with 15 degrees to one hour. In the maps this was later replaced by angular measure from the meridian through the westernmost point of the Fortunate Isles, today's Islas Canarias. Book VIII includes a list of important locations in the maps, each accompanied by its latitude in solstitial hours and its longitudinal distance from Alexandria, also in hours. Longitude was difficult to establish, because one must know the precise time difference between the point to be measured and the prime meridian and thus two clocks are required, one at least a reliable and portable clock. Only Harrison's chronometer provided, in the 18th century, a reasonable solution to the problem. Later, radio signals replaced the portable clock. And only recently have GPS methods freed us from the need for clocks.

Ptolemy based his work in cartography and toponymy on the much too small Earth circumference of Poseidonius and Marinus, and not on the earlier but much more accurate value obtained by Eratosthenes. This resulted in his 'metric' values of a degree of longitude (Earth circumference divided by 360) being too small. Also, he accepted an exaggerated length of the Mediterranean Sea – some 60 degrees of longitude instead of some 40 degrees in reality. Moreover, he assigned to Asia a too large West-to-East extension. And this had an interesting sequel some 1350 years later. Columbus, in the late 15th century, claimed that the westward distance by sea from Spain to to Cathay, China, was less than that by the eastward overland route taken for example by Marco Polo. He based this claim on Ptolemy's data of a smaller-than-real Earth and a greater-than-real West-to-East extension of Asia. And when he finally sailed westwards in 1492 and landed on the Caribbean island of Santo Domingo, he assumed that he had reached India. This is the reason that these islands are called the West Indies to the present day, and most endemic peoples of America, from North to South, are popularly called Indians.

Ptolemy the Cartographer

Now we come to the great Alexandrine's role as a cartographer and must return for a moment to the definition of cartography. As part of this definition it was mentioned that cartography includes the collecting of geographically-referenced data, that is, data with quantitative coordinates and not only names. Furthermore it entails editing, graphic designing the map and, of course, displaying the data. Viewed in this light, we recognize that Ptolemy's work in geography would today be regarded as topographic cartography (not as thematic mapping), and him as being a cartographer. So if we wish to appraise Ptolemy's work in cartography we can safely say that we have already covered very much of it: collecting data, designing a framework for presenting the data (the graticule of parallels and meridians) and inserting the data in this framework in the form of lists. Two important aspects still had to be dealt with. One was the major problem of cartographic projections, a projection being defined as a method of transferring geographical locations from the spherical Earth to the flat sheet of paper. The other was how, in practice, the map was to be made. He addressed them both in Book I of the *Geographia*, but we shall not deal with them in the present context. Suffice it to say that Book I provides instruction in constructing two map projections. One was a kind of composite conic projection, covering the tropical, subtropical, temperate and northern parts of the Earth, and this was combined in the South along the equator with a 'skirt' in the form of a subsidiary projection which even today has no name. It is interesting to note that until quite recently this 'seamless' combining of two projections has hardly been used; but a few years ago Canada resorted to one. The second projection shown in the *Geographia* is a beautiful and ingenious modification of the one just described – modified so that the meridians are curved lines which, if extended, would meet at the North Pole. Both projections had standard parallels in addition to the equator.

The second problem related to the graphic representation of the Earth in a plane as recognized by Ptolemy concerned the division of the world map into separate sheets of relatively large scale and greater detail compared with the world map. Ptolemy, who addressed this problem in Book VIII, was the first person known to have produced what we now call an atlas, that is, a collection of maps of uniform size, bound together in book form, but differing widely in map scale. But the name 'atlas' for a book of maps was

first used by Gerardus Mercator in the middle of the 16th century. The maps of the so-called *Atlas of Islam* in the 10th and 11th centuries were based on a similar system, as were Idrisi's 70 map sheets in the 12th – but without a mathematical framework, i.e. a map projection.

All early editions of the *Geographia*, namely the A-versions, had, in addition to the world map, 26 regional maps divided as follows: 10 maps of Europe, 4 of Africa and 12 of Asia. Ptolemy described his method of dividing the œcoumene into continents, and these he divided into map sheets – just as we do today. To these 26 'traditional' maps were later added a number of so-called modern maps, 'tabulae modernae' in Latin, originating not in antiquity but in the late 15th and 16th centuries. These 'non-traditional' maps usually differed from the old maps in contents and partly in style. Thus, the map of the Holy Land was copied from a map made by Pietro Vesconte for Marino Sanudo's book *Liber secretorum fidelium crucis* of 1321. It was oriented to the East, whereas Ptolemy had North at the top of his maps, as we have today in most cases. However, since the tabulae modernae were not the work of our ancient cartographer, I will not treat them here further.

Toponymy – with some examples from the Holy Land

We now come finally to the toponymic part of Ptolemy's work as reflected in the great list of names in Books II to VIII of the *Geographia*. In the nearly 8,100 listings Ptolemy follows mostly Latin names; after all, nearly the entire œcoumene was at one time or the other conquered by the Romans or ruled by them, and even he himself lived in Egypt under Roman domination. So he had to translate, transcribe and transliterate – typical activities of the toponymist. Many of the names have changed through the centuries – and millenia – since his time; but many others have hardly changed. A considerable number of what we now regard as errors have been introduced by four agents, namely the informants who supplied Ptolemy with the names; Ptolemy himself; the translators; and perhaps even more, the copyists of the work. In the ensuing, I will not follow specific or particular editions. Sometimes double names appear, even in the same edition, such as Brittanicae Insulae in the list and Albionis Insulae in the map, which in some editions are Alvion and Insulae Prettanicae. On a recent visit to the Greek islands of the Northern Aegean Sea I toured the islands of Samothraki and Limnos. The *Geographia* lists them as Samartaca and Lempnos. The first is the 'Samos of Thrakia', from where Poseidon watched the Troian War. So the form Samartaca is clearly distorted. Limnos derives from limne, lake or pool, and the Ptolemaian 'p' is superfluous. Who introduced the errors? Above we listed possible sources. A further inconsistency occurs where names in the world map differ from those in the regional maps. Thus, in the text Byzantium is called by this name in the regional map of Thrakia, whereas in the world map it appears under the much later name Konstantinoupolis. This must have originated when the copyist in the late Middle Ages introduced his own *quasi* updated knowledge. The same is true of the name Athos mons in the map: the Monasterial Republic of Mount Athos, where I was invited to view one of the oldest manuscripts of the *Geographia*, dates from the 10th century.

It has been said that Ptolemy's Latin was not quite perfect. Dilke writes in 1987 for example that it may be understandable that instead of the place name Alba Fucens in Italy, Ptolemy wrote in the name list Alpha Bucens, where Bucens has no meaning, while Alba is white in Latin and fucens may have been connected with colouring or dyeing. Dilke mentions that the most glaring mistake in Latin seems to have been the name of a place in Germany which Ptolemy called Siatutanda. Tacitus, in referring to a certain Germanic tribe, wrote 'ad sua tutanda', i.e. for their protection. Ptolemy apparently used this source and named a place in Germany Siatutanda. Still, the name list is an outstanding achievement.

Israel and the land on both sides of the river Jordan have been the subject of more maps and a greater continuity of mapping than any other country in the world, owing to their being the Holy Land to both Judaism and Christianity. Because of this continuity of cartographic representation a number of biblical place names in this country will be mentioned which appear in Ptolemy's *Geographia*, where one finds

them in Book V in their exonymic Greek or Roman form. Only a few of these forms and the original biblical ones will be listed, together with the names in use today, omitting some intermediate forms.

Caesarea Stratonis is still called Caesarea.
Ioppa was biblical Hebrew Yafo and is today Jaffa, Arabic Yāfā and in Hebrew again Yafo.
Iamnia stands for Hebrew Yavneh.
Azotus is Hebrew Ashdod.
Ascalon is Ashqelon.
Jordanus is the River Jordan.
Asphaltidis lacus is the Dead Sea, Yam haMelah in Hebrew, i.e. Salt Sea.
Tiberiadis lacus is the Lake of Galilee, Yam Kinneret in Hebrew and often still called Lake Tiberias.
Sapphora was Roman Sephoris and Hebrew Zippori.
Lydda is the Hebrew Lod and remained Lydda in Arabic.
Betogabri is Hebrew Bet Guvrin, became Arabic Beit Jibrīn and reverted to the Hebrew form.
Emmaus or Emmautha is still Emmaus and also Latrun.
Guphna is biblical Gofna but does not exist anymore.
Engada is the Hebrew En-Gedi.
And finally, Hierosolima [que nunc dicitur (Aelia) Capitolia] is Jerusalem, Hebrew Yerushalayim.

The first (Ptolemaic) name in each case is Greco-Roman. The Hebrew names mentioned are today's standardized and official ones for these places in Israel. They are all, without exception, exactly the same as found in the Bible which was, of course, originally written in Hebrew.

The First-Ever Geographical Gazetteer

One of the important functions of today's UNGEGN is encouraging and supporting the production of geographical gazetteers. According to the *Glossary of Toponymic Terminology* [3] a gazetteer is defined as a "list of toponyms in alphabetical or other sequential order, with an indication of their location and preferably including variant names, type of topographic feature and other defining or descriptive information". This is, of course, a modern definition listing present-day requirements. It may therefore come as a surprise how nearly Ptolemy anticipated such needs.

The ordered list of some 8,100 geographical names which constitutes Books II to VII of the *Geographia* is the first-ever example of a true geographical gazetteer. How is it organized, and which items of information – or, in modern terms, which data fields – does it contain?

Since Ptolemy assumed that the reader would look for a name within a certain defined geographical area, he arranged his list not alphabetically but in another "sequential order" (see definition above), with the separate maps constituting the first level of sorting. The maps comprising the atlas (not so labelled by Ptolemy) were appended to the verbal and tabular text of the *Geographia* and in the A-version, which must have been the one originally produced by Ptolemy, included 10 maps of Europe, 4 of Africa and 12 of Asia, preceded by the world map. The name list starts in Book II with "Prima Evropae tabula" (first map of Europe). Within each map section of the list, the names are arranged according to geographical areas or political units as a second level of sorting. Thus, in Liber (Book) II, Tabula prima Evropae, Caput (Chapter) III: Albionis Insulae Brittaniae situs.

What came first – the list or the maps? As mentioned above, the original maps were lost, but were perhaps reconstructed a thousand years later with or without the help of the name list in the surviving Books II to VII of the *Geographia*. The original maps, too, must have been produced on the basis of name lists or other maps. Only the order of appearance of the names in the list forming Books II to VII was certainly performed on the basis of Ptolemy's (original) maps.

And now we must turn to the contents of the name list. Primarily, which types of geographical features does it contain? The predominant items are, quite naturally, inhabited places: cities, towns and even villages. Further we find names of physical geographical regions as well as of political divisions as well as of peoples and tribes, often constituting the headings of "paragraphs" as explained above. Very sensibly, physiographic point features are included, such as the mouths of rivers and river confluences, heads of promontories and other geographically identifiable objects. Mountains are also found in the list, as are lakes, usually denoted by a representative point within their circumference. The list is, therefore, much more than just a "place names gazetteer" which, according to the *Glossary of Toponymic Terminology*, lists only populated places.

The second issue to be examined in connection with the contents of the name list is again one in which Ptolemy preceded our work in UNGEGN today. This concerns the items of information appended to each entry in the name list.

Naturally, the main item is the geographical name itself. In the original this appeared in Greek – either as a Greek exonym or in conversion from the source language or script into Greek writing. This proves the fact that Ptolemy must have been an expert in the conversion of geographical names, too. If the original name conveyed to him was in a script other than Greek, it had to be transliterated; we might call this operation *toponymic hellenization* or perhaps *grecization*, the counterpart of today's romanization. In many cases, if not in most, this was not enough: Greek exonyms had to be substituted for endonyms. Within the rather sketchy boundaries of the empire of Alexander the Great this was not too difficult. Of course, a great number of geographical names Ptolemy extracted from existing sources; others he obtained from travellers and other informants. But even for these he had to verify the Greek spelling. When the *Geographia* was translated into Latin over a thousand years later the names in the list, too, were converted, not only from the Greek alphabet into the Roman one but also from Greek or hellenized name forms into Latin ones.

The second item of information in the list was the location of the referenced object. And it is here that Ptolemy really did pioneering work. We know of numerous lists of geographical names in antiquity more or less strictly organized or arranged. Thus, a very detailed list of Hebrew names of populated places and some physiographic features delineating the borders of ancient Israel and its division into tribal areas is included in the Old Testament in the Book of Joshua, chapters 15 to 17, where the names can be found today in amy Bible. A similar but much more extensive and more structured list of 983 biblical place names was produced by Eusebius, Bishop of Caesarea, around the year 320 under the name *Onomasticon*, i.e. name list (the present writer named his modern-day gazetteer of Israel containing some 7,000 names *Toponomasticon* [4] in honour of Eusebius). Sources of names, albeit dispersed and unstructured, can be found even much earlier, e.g. in the Egyptian Tell el-Amarna tablets of the 15th cent. BC. But Ptolemy was the first to systematically indicate the location of his 8,100 names with the aid of coordinates – something we learned from him, and today regard as a normal requirement of any gazetteer.

These Ptolemaian coordinates are of interest. At first they were computed in hours, for both latitude and longitude. Latitude then, even as now, was much easier to fix than longitude. Today any youngster can determine approximate latitude at night just by measuring, or even estimating, the altitude of Polaris, the (North) Pole star in degrees above the horizon. For longitude one would need two clocks, one showing local time and the other the time at the prime meridian (today Greenwich) – or a clock and a radio signal, as was explained above. The recently introduced satellite-dependent global positioning systems (GPS) have simplified matters – if one has the appropriate instrument. Ptolemy at first expressed latitude in solstitial hours and longitude in hours East or West of the prime meridian through Alexandria, for several hundred places. In the name list and in the maps both coordinates are expressed in degrees, the former from the equator and the latter from the Fortunate Isles. The determination of longitude

was much less precise than that of latitude, and one realizes this immediately one takes a look at a Ptolemaian map. Concerning the two different coordinate systems, even today we use different coordinate nets, such as the UTM (Universal Transverse Mercator) instead of, or side-by-side with, geocentric coordinates based on the 360 degrees or 400 grad system. While at least in the better known regions of the œcoumene such as the Mediterranean basin latitude values conform to a surprising degree to those we use today, longitude values are not only larger than present-day values by some 20 degrees because of Ptolemy's more westerly prime meridian, but because of his reliance on Posidonius' measure of the Earth's circumference.

It was probably the coordinates in Ptolemy's name list which enabled cartographers in the Renaissance to reconstruct the missing maps. In one of my courses at the Hebrew University of Jerusalem I ask my students to reconstruct the map of Israel only from the tabular data in the *Geographia*, as it might have been done in the past, i.e. just from the geographical names and their coordinates.

Summing up

If we permit ourselves to judge – or criticize – Ptolemy's work in toponymy (or in any other of the numerous spheres in which he was active and productive), we should remember that we do so with the benefit of hindsight. What should be done (and the present writer tries to do this) is to remember that all human achievements must be viewed in the light of their contemporary level of knowledge and technology. One cannot simply say "Here Ptolemy erred"; one must turn the statement into a question and ask "Could Ptolemy, in the light of existing possibilities, have arrived at a better solution?". The great Alexandrine Greek was confronted – basically – by the same limitations facing all toponymists and cartographers of all ages, including our own: he had to rely on "informants". After all, no living person is able to check on his own all geographical names in the world. So one has to find the best and most reliable sources available. This is something every toponymist under training is taught, and participants in UNGEGN training courses and seminars will remember it from their field exercises. Although it is known from the records of his astronomical observations that Ptolemy did travel, he was, as keeper of the great library at Alexandria, tied to his post much if not most of the time. While we are far from comparing the two, his problem was well illustrated by the Geographer in Antoine de St. Exupéry's book *The little Prince*.

So now we arrive at the summing up. We do not know whether a sense of history was among Ptolemy's qualifications, but at least he was acquainted with the history of his profession. We have demonstrated his competence in all other domains demanded of a U.N. toponymist. Although it is difficult, if not impossible, to distinguish with certainty between some aspects of Ptolemy's own work and that of others who either preceded or succeeded him, and in spite of many discrepancies between names in different editions of his work, and the fact that he must have relied heavily on external sources, he was a great innovator and originator in world geography, but particularly in cartography and toponymy. There can be no doubt about his being the author of a most innovative composition – original not so much in its content as in its form – an "atlas" with a gazetteer of geographical names. He was indeed the first 'quantitative' toponymist.

So if we expand the acronym UNGEGN into

"Un-Nationalistic Greek Expert on Geographical Names"

we finally justify the title of this paper. My presenting it here can be regarded as a token of my esteem and admiration for this illustrious scholar and scientist to whom I owe much of the basis of my profession.

Notes

[1] See also N. Kadmon, "Luxor or al-Uqsur – Skagerak, Skagerack or Skagerrak? The United Nations and the Standardization of Geographical Names". **Onoma**, Journal of the International Council of Onomastic Science, Vol. 32, 1994-95, p. 140.

[2] Antoine de Saint Exupéry, *Le Petit Prince*. Editions Gallimard, Paris, 1946.

[3] United Nations Group of Experts on Geographical Names, Working Group on Toponymic Terminology, *Glossary of Toponymic Terminology*, version 4.

[4] N. Kadmon, *Toponomasticon – Geographical Gazetteer of Israel*. Survey of Israel and "Carta". Jerusalem, 1994.

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