The effects of reading speed and reading patterns on the understanding of text read from screen

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ABSTRACT

With increasing use of the World Wide Web, rapid scanning or skimming of material on screen has become a frequent activity. However, the outcome of this method of reading has not been thoroughly investigated. Using a range of question types, comprehension was measured after reading from screen at both a normal and fast reading speed. In addition, by automatically recording how readers scrolled through each document, reading patterns were explored. A speed-accuracy trade-off was found and, in general, the recall of specific details was less accurate than responses to ‘higher order’ questions. However, questions that addressed the structure of the text were hardest. Analysis of the scrolling movements showed that the overall time spent pausing between movements was the best predictor of comprehension. At a normal reading speed, the most effective readers, in terms of higher comprehension scores, were those who spent more time between scrolling movements, which were fast and frequent.

INTRODUCTION

Over the past five or so years, the rapid development of the World Wide Web (WWW) has led to more people accessing information on screen and an increase in the volume of material we can read from screen. Yet as early as 1991, Muter and Maurutto discussed the importance of investigating skimming from screens, because of the widespread use of email, on-line abstracts, information retrieval, etc. It is often reported that material displayed on computer screens (in particular, web pages) is skimmed, rather than read in detail (e.g. Horton et al, 1996, p. 320). This may be due to the volume of information, the characteristics of the medium, the purposes of the reader, or some combination of these factors.

However, in an experimental setting, research has shown that reading from screen is 20% to 30% slower than reading from paper (Dillon, 1992). Rapid reading from screen must therefore be viewed as a deliberate strategy. Alternative browsing strategies
with specific purposes have been identified in the literature on hypertext and the WWW (Rada and Murphy, 1992; Smith and Wilson, 1993; Catledge and Pitkow, 1995).

A detailed study of skimming stories in print has been carried out by Masson (1982) in which the nature of comprehension processes at different reading speeds was examined. Although directed to skim for gist, participants in the study were unsuccessful in retaining such information as reading rate increased. Important and unimportant information was equally likely to be skipped. Surface memory (i.e. recognition of specific wording of statements) was also more accurate at a normal reading rate, compared to skimming.

Skimming from computer screens was investigated by Muter and Maurutto (1991) in a comparison of reading and skimming from ‘books’ and screens. Although the nature of comprehension was not examined, a surprising finding was that comprehension was higher when reading from screen. This could be accounted for by a speed-accuracy trade-off, as the skimming speed from paper was significantly faster than from screen.

These two studies illustrate the predictable finding that an increase in reading speed is likely to be at the expense of comprehension. However, there are suggestions that faster reading may differentially affect the type of information that is retained. One means of categorising different types of comprehension is to distinguish between the recall of details, more general ideas, and higher order processes requiring inferences. Perkins and Brutten (1992) have used factual recall, generalisations and inferences in investigating second languages. Similarly, details, main ideas and inferences have been examined in relation to the development of reading strategies (Moore and Scevak, 1997).

The research reported in this paper investigates the nature of differences in comprehension when reading at a normal and fast speed and examines the pattern of reading, in terms of scrolling through the text. A range of questions was chosen with the aim of eliciting recall or understanding of different types of information in the documents. These questions were based on studies that explore reading strategies by encouraging participants to read actively for different types of information (McConkie, Rayner and Wilson, 1973; Wagner and Sternberg, 1987). In this experiment, no indication was given as to how the document should be read, as we hoped to discover which types of information are generally recalled under different conditions.

At the outset it was necessary to establish an objective basis for devising the questions. Although the general nature of questions could be defined, e.g. detail vs. main facts, this division requires identification of the relative importance of different parts of the text. Johnson (1970), and other authors subsequently (e.g. Brown and Smiley, 1977), have shown that the importance of units of text is related to their recall. In order to base a question on a more important part of the text, there needs to be a measure of the relative importance of units within the text. Two pilot studies were therefore conducted to provide a basis for creating the questions and testing their accuracy.

**PILOT STUDIES**

**Materials and question types**

Six types of questions were identified which appeared to require either recall of specific information (detail or a main fact) or inferences about what was read (‘higher order’ questions, cf. McConkie, Rayner and Wilson, 1973). Five of the six question
types were written as multiple choice questions, with three alternative answers. The sixth type of question measured recognition of short extracts (a sentence or the first part of a sentence) from the document.

Title questions (T) asked which of the alternative titles best fit the text. Main idea questions (MI) covered one of the main ideas in the text. Structure questions (S) asked about the order of items within the text, i.e. what came before or after a particular item. Main factual questions (MF) asked about relatively important aspects of the text. Incidental questions (I) concerned details in the text. Recognition questions (R) asked whether the extract had appeared in the text.

A number of articles that were considered to be of general interest were selected from the magazine *National Geographic*. (Permission was obtained to use these articles.) The documents were edited to be approximately equal length (up to 1000 words) by deleting text from the end, ensuring that the story line remained intact.

Only one title, main idea and structure question could be written for each document, as these tended to encompass the whole document. However, it was possible to develop three main factual and three incidental questions for each text. In each case, one of the incidental questions referred to a number in the document. Recognition questions consisted of ten short extracts, of which five were taken from the text that had been read, and five from the same source material, but from a part that had not been read. This ensured that the theme and writing style of the extracts were similar.

**Pilot study 1**

The first pilot study aimed to establish the relative importance of different parts of the text. Each document was divided into idea units by the two authors, independently. An idea unit was defined as a discrete semantic unit, whereby a new unit started when the ideas or meaning of a section changed. This procedure is loosely based on the method developed by Johnson (1970) that divided texts into linguistic sub-units. However, our units spanned a number of sentences, whereas Johnson’s ‘pause acceptability’ units were much smaller, often part of a sentence. There was substantial agreement between the two assessors on the location of boundaries between units. Where differences arose, the two assessments were combined to produce a greater number of units, i.e. if only one of the authors suggested a new unit, this was still incorporated. The number of idea units created by this method ranged from 12 to 20 per document.

**Method**

Fifteen participants each read four documents on paper from a total of twelve documents. Each document was read by five participants and the combination of documents and order of presentation was balanced as far as possible. The text of the documents was divided into idea units and the participant was asked to rate the importance of each idea unit from 1 (not very important) to 7 (most important).

**Results**

The ratings for each idea unit within each document were averaged across participants to obtain an indication of the perceived importance of each unit, relative to
others in the document. The most important units were therefore identified which provided a criterion for developing questions that addressed the main issues in the document, as opposed to details or incidental facts.

Most of the main idea, structure and main factual questions that were created from this pilot work were based on the more important units. Incidental questions were spread over more of the document, as it was not possible to derive sufficient questions from the least important units. However, within each document, the overall importance ratings for incidental questions were lower than for main factual questions.

**Pilot study 2**

This pilot study tested the accuracy of the questions by asking participants to answer questions whilst referring back to the document. Questions that are consistently answered incorrectly may identify problems with the correct answer or the alternatives. An indication of the perceived difficulty of different types of questions was also obtained.

**Method**

Twelve participants were each asked to read a different combination of three documents on paper from a total of twelve documents, used in Pilot 1. Each document was read by three participants. Having read a document, participants were asked to answer nine multiple choice questions (one title, one main idea, one structure, three main factual, three incidental). Recognition questions were not included as any errors in this task would be purely oversights. The questions and alternatives were presented in random orders. When the questions had been answered, participants rated their difficulty on a 1 to 9 scale, ranging from 1 (very easy) to 9 (very difficult).

**Results**

Questions that were answered incorrectly by two or more people were identified. These were mainly the higher order questions (title, main ideas, and structure questions). The question and possible answers were examined, taking into account the nature of the incorrect responses. If the same incorrect answer was chosen twice, this alternative was replaced. Other modifications were attempts to strengthen, elaborate upon or simplify the correct answer and alterations to the wording of alternative answers.

The perceived difficulty of each type of question varied slightly from document to document. However, on average, main factuals were regarded as more difficult than incidentals and questions on the title were considered particularly difficult. These ratings are likely to be influenced by the ability to refer back to the document. Nevertheless, the results suggest that there are differences between question types and therefore some evidence that the aim of developing questions that reflect different types of information in the document was achieved.

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MAIN STUDY

Method

Training

In order to develop a reading speed that was faster than the participants’ normal reading speed, a period of training was introduced at the beginning of the study. Participants were asked to read an initial document at their normal, comfortable reading speed. They were then asked to speed up their reading and try to read the next document at twice this rate. If they achieved this, they proceeded to the testing stage of the experiment. If they had not read fast enough, they were asked to read another document. On each trial, a new document of approximately 500 words was used. The procedure continued until the participant either reached the target speed or had read eight documents. In the latter case, if the participant’s reading time was no more than 70% of their first reading time, they continued with the experiment. If they had not been able to speed up their reading sufficiently, they did not take any further part in the experiment. A more liberal criterion (70% rather than 50%) was used as pilot work indicated that it might be difficult to reach a rate twice as fast as normal reading speed. We wished to reflect, as far as possible, people’s natural capabilities.

Document presentation

A Compaq Prolinea 575 computer was used to present the experimental material on a Sony Multiscan 15sf colour monitor with a video image area of 11.25″ by 8.5″ (14″ maximum viewing image). This was set to a resolution of 800 × 600 pixels and 256 colours. The text was displayed in 10 point Arial with 12 point interlinear spacing, an additional 12 points between paragraphs, and a line length of approximately 60 characters per line. Items such as tool bars, menu bars and scroll bars were removed from view.

Procedure

Twenty four volunteers were recruited locally and the majority (19) were between 18 and 24 years old (students at the University of Reading). Half reported that they frequently read text on screen. On successful completion of the training stage, participants each read six documents, three at their normal reading speed and three at a faster rate. Half of the participants started with their normal reading speed and half with the faster rate. The pairing of documents with reading speed and the order of presentation was determined by a Greco-Latin square balanced design.

Each block of three documents was preceded by a practice trial that familiarised participants with the type of questions they would be asked and ensured they knew how to move through documents and call up the next document. A ‘Start’ key displayed the document on screen and recorded the start time. The down and up cursor keys were used to scroll through the text, line by line, and the time of each keystroke (and direction) was recorded by programs running the experiment. At the end of a document, pressing an ‘End’ key displayed a blank screen and recorded the time.

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Nine multiple choice questions were asked about each document with three alternatives per question, which were answered without referring back to the document. There were questions on the title, main idea and structure, three main factual questions, and three incidental questions. The order of questions and order of alternative answers were randomised for each participant. These questions were immediately followed by ten recognition questions. An example of a text and the corresponding questions is given in the Appendix.

Results

Speed of reading

The mean reading rate in the normal reading condition was 4.06 words per second (equivalent to 244 words per minute; s.d. 1.23 words per second). In the fast reading condition the mean reading rate was 7.66 words per second (equivalent to 460 words per minute; s.d. 2.32 words per second). Participants managed to sustain their faster reading at a rate almost twice as fast as their normal reading speed. These two speeds are comparable to two of the rates quoted by Masson (1982), which were 225 and 375 words per minute. Although Muter and Maurutto (1991, p. 260) asked their participants to ‘proceed at a rate three to four times faster than normal’, on average they read at 199 words per minute and skimmed at 501 words per minute.

A log transform of reading rate was carried out prior to statistical analysis [\(\log(\text{words per second} + 1)\)]. This transformation is useful when times are recorded, as such measures have a minimum limit, but no maximum (Kirk, 1995).

Reading speed and type of comprehension

The answers to the multiple choice questions were scored as a proportion and then transformed \(2 \arcsin(\sqrt{\text{score}})\) for statistical analysis. Where scores are a proportion of perfect performance there is a maximum limit and an angular transform is then appropriate (Kirk, 1995).

To make a comparison across all the question types, the recognition scores were adjusted. This was necessary as chance level of performance for the multiple choice questions is 0.33 (as three alternatives were available), whereas chance is 0.5 for the recognition questions. The adjustment standardised chance level at 0.33 for all questions, so that scores became relative to their distance above or below chance. Following these adjustments and transformations, chance is equal to 1.57 and a perfect score 3.14 for all question types.

Figure 1 illustrates the comprehension scores for each question type at each reading speed. The standard error bars on each data point give an indication of the variability between subjects. These are larger for the title, main idea and structure questions as the data points are based on fewer questions. \(\text{SE}_w\) indicates the standard error of the differences between any pair of means, a within subject comparison.

Analysis of variance reveals a main effect of reading speed \(F(1, 23) = 6.79, p = 0.016\) and of question type \(F(5, 115) = 3.75, p = 0.003\). The order from easiest to hardest questions is: main idea, title, main factuals, incidentals, recognition, structure.
The level of comprehension is better at a normal reading speed, as might be expected. A post hoc test (Duncan’s Multiple Range) found that there are no statistically significant differences between question types at the fast reading speed, but at the normal speed, the title and main idea questions are answered better than the structure questions ($p < 0.05$). The greater variation between questions when reading at a normal speed may have been due to the higher level of performance. Recognition questions are the only type of question where the difference between normal and fast reading speeds is statistically significant. This result agrees with the finding of Masson (1982), based on reading print, that surface memory for specific wording is less accurate when skimming.

On the whole, the questions that aimed to test recall of specific information were answered less accurately than those that were more general, and based on more important units of text. There is therefore some support for the relationship between relative importance and recall found when reading print (Johnson, 1970; Brown and Smiley, 1977). However, the structure question appears to be an exception to this pattern, as it was answered consistently poorly, whatever the reading rate. Although this question was initially conceived as a relatively general question, it nevertheless requires recall of the location of at least two pieces of information (the item in the question and the answer). As such, it could be re-classified as a more detailed question.

There was natural variation between participants within each of the two reading rates. Pearson’s Product-Moment Correlations were therefore computed between individual reading rates on each document and comprehension according to the different types of questions. At both reading speeds, there were significant negative correlations between reading rate and main factual questions (normal: $r = -0.37$; fast: $r = -0.53$), incidental questions (normal: $r = -0.45$; fast: $r = -0.52$), and recognition questions (normal: $r = -0.57$; fast: $r = -0.58$). Comprehension scores

Figure 1. Mean comprehension scores according to question type when reading at a normal and fast speed.
are lower when the document is read faster. Correlations with other question types (title, main idea, structure) may have failed to reach significance because of the smaller sample size.

There is no evidence that different types of information are recalled at different reading speeds. As mentioned earlier, this could be due to a floor effect at the faster speed. Also, participants’ familiarity with the range of questions they were required to answer may have influenced their reading strategy. Practice trials introduced the nature of questions used in the experiment and subsequent trials during the course of the experiment would have reinforced this pattern of questioning. A practical strategy would therefore be to maximise the chance of being able to answer all types of questions.

Whether this type of strategy can be implemented is debatable. McConkie et al (1973) found that readers’ expectations of the information required to answer questions influences what type of information they acquire. However, their study revealed limitations on the ability to adopt successful strategies, in particular with higher order and recognition questions. Masson’s (1982) findings also question readers’ ability to control the acquisition of particular types of information at a faster reading speed. As a within subject design was used in the current experiment due to practical considerations, the effect of prior knowledge of question types on subsequent comprehension cannot be identified.

*Reading patterns and overall comprehension*

The record of keystrokes used to move through the documents was summarised in a number of ways. When participants scrolled through the document, the time of each key press was recorded and these were grouped into discrete ‘movements’ with ‘pauses’ in between. A movement was defined as single or multiple key presses that were separated from other key presses by at least 3 seconds. Any key presses that followed on from other presses within 2 seconds were regarded as part of the single movement (cf. de Bruijn, de Mul and van Oostendorp, 1992). This classification of individual keystrokes was used to construct a profile of how participants moved through each document. This included the time spent in pauses and movements, the number of movements and the length of the first pause.

In order to explore the possible relationship between the variables obtained from the keystroke data and comprehension, a multiple regression was carried out, separating the normal and fast reading speed. Reading rate is also included as a variable to estimate its importance in relation to the other variables. Table 1 gives the inter-correlation matrices for normal and fast reading speeds. Time in pauses has the highest correlation with overall comprehension and is also highly correlated with reading rate. Some other variables have significant intercorrelations with each other.

The regression identifies the combination of variables that produces the highest adjusted $R^2$ (adjusted for the number of variables in the model). Table 2 lists these variables, with the corresponding $R^2$, at the two reading speeds. Numbers in parentheses are standardised regression coefficients, showing the relative importance of the variable effects when not affected by scales of measurement.

At normal reading speeds, readers who spend longer pausing between scrolling, with a greater number of individual short scrolling movements, minimising time in movement, show better comprehension. When required to read fast, the length of
The time spent pausing between movements is the best predictor of comprehension. The correlation between time in pauses and comprehension suggests that most reading is taking place when the text is stationary (during pauses) and that this may be the most efficient time to absorb information. Consequently, at a normal speed, scrolling relatively small amounts minimises the time between bursts of reading and may therefore be less disruptive to the flow of reading and information acquisition.

GENERAL DISCUSSION

The findings of this research should be considered in the context of the type of reading or browsing of text on screen that is considered to be fairly typical (e.g. Horton et al, 1996). Web pages and email messages may be skimmed through as a means of dealing with large volumes of material, or possibly because many people still perceive reading from screen as less comfortable than reading print (according to many anecdotal reports). This research has explored the outcome of faster reading and demonstrated that this results in an overall decline in the level of comprehension, compared with reading at a normal speed. The nature of the information that is

<table>
<thead>
<tr>
<th>Reading speed</th>
<th>Adj. R²</th>
<th>Variables in the regression model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>0.25</td>
<td>Time in pauses (0.45); Number of movements (0.27); Time in movements (−0.2)</td>
</tr>
<tr>
<td>Fast</td>
<td>0.29</td>
<td>Time in pauses (0.54)</td>
</tr>
</tbody>
</table>

Table 2. Results of multiple regression analysis: variables that account for differences in comprehension at normal and fast reading speeds.

Table 1: Pearson Correlation Coefficients at normal and fast reading speeds.

<table>
<thead>
<tr>
<th></th>
<th>Reading rate</th>
<th>Time in pauses</th>
<th>Time in movements</th>
<th>Length of first pause</th>
<th>Number of movements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normal reading speed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall comprehension</td>
<td>−0.45**</td>
<td>0.48**</td>
<td>−0.18</td>
<td>0.32</td>
<td>0.1</td>
</tr>
<tr>
<td>Reading rate</td>
<td>−0.95**</td>
<td>0.05</td>
<td>−0.51**</td>
<td>−0.08</td>
<td></td>
</tr>
<tr>
<td>Time in pauses</td>
<td>−0.29</td>
<td></td>
<td>0.59**</td>
<td>−0.1</td>
<td></td>
</tr>
<tr>
<td>Time in movements</td>
<td>−0.44**</td>
<td></td>
<td>0.59**</td>
<td></td>
<td>−0.34*</td>
</tr>
<tr>
<td>Length of first pause</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fast reading speed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall comprehension</td>
<td>−0.47**</td>
<td>0.54**</td>
<td>−0.2</td>
<td>0.29</td>
<td>0.07</td>
</tr>
<tr>
<td>Reading rate</td>
<td>−0.89**</td>
<td>−0.04</td>
<td>−0.36*</td>
<td>−0.36*</td>
<td></td>
</tr>
<tr>
<td>Time in pauses</td>
<td>−0.36*</td>
<td></td>
<td>0.43**</td>
<td>0.11</td>
<td></td>
</tr>
<tr>
<td>Time in movements</td>
<td>−0.33*</td>
<td></td>
<td>0.56**</td>
<td></td>
<td>−0.35*</td>
</tr>
<tr>
<td>Length of first pause</td>
<td></td>
<td></td>
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*p < 0.01; ** p < 0.001.
retained is similar. At both speeds, details are less well recalled than more general information, although faster reading may cause additional difficulties in recognising precise wording.

The consequences of this pattern of poorer recall can only be assessed in relation to the objectives of reading. For example, if web pages are skimmed to decide whether the material is worth reading more thoroughly, the loss of detail is not a problem. However, the number of main, important ideas that are missed is likely to determine the usefulness of this form of reading. If the reader aims to gain a comprehensive overview by rapid reading, these results suggest that there are likely to be some gaps. As discussed earlier, research findings are inconclusive as to whether readers can adapt how they read in order to retain relevant information, particularly at fast speeds. Despite this caution, it should be noted that the differences in comprehension at the two reading speeds are not particularly large. In many circumstances, the benefits from covering more material in a limited time may make the loss of comprehension seem a relatively small cost.

The extremely poor performance on structure questions revealed an inability to locate specific content (e.g. ideas, events) in relation to other information. This occurred at both reading speeds and appears to identify a particular difficulty in recalling a sequence of events when the document is read on screen. It is possible that the scrolling display contributed to the difficulty in answering these questions. Cues to location that are available in print, or in paged screen displays (e.g. near the top of the page) are lost when text is scrolled within a window (see Piolat, Roussey and Thunin, 1997). Remembering what precedes or follows particular sections of documents is helpful when editing a document or going back to re-read a section. These results indicate that readers may have difficulty in judging where in the document on screen they should look. Fortunately, various software provides search facilities that are a more efficient way of locating material, if precise wording can be recalled.

Current interfaces allow readers to control the way in which they move through text. The content of web pages often extends beyond the window on screen and therefore scrolling is necessary to continue reading. These results show that readers who spend longer pausing between scrolling, maximising the time that the text is stationary, comprehend more. Future research could usefully explore whether encouraging this type of pattern improves reading efficiency (measured in terms of reading speed and comprehension). Ideally, support for the more efficient methods of reading from screen could be built into the design of future interfaces, in particular web browsers.

Another variable that can often be set by readers in their web browser is the width of window, or line length of text. This has been shown to affect the rate of reading from screen (Duchnicky and Kolers, 1983; Dyson and Kipping, 1998). However, further research by the authors is studying the effect of line length on comprehension when reading at normal and fast speeds with the range of question types used in this study.

Ironically, the flexibility of display formats (e.g. line lengths) and choice of reading patterns (e.g. methods of scrolling) afforded by current interfaces make it more difficult to support efficient reading. Readers are able to make choices as to how text is presented and how they navigate through the material. In print, the results of legibility research can be put into practice in designing readable text, as the medium fixes the format. As research furthers our knowledge of the optimal conditions for
reading from screen, we may need to consider once again limiting reader’s control of their reading environment. This has already begun with the introduction of style sheets in web documents, allowing authors/designers to determine the presentation of text. We may wish to leave readers to make their own choices, perhaps with some recommendations. However, research of this nature needs to progress to match our knowledge of designing and reading print.

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Appendix: Example of a text and questions

It was the first day of the Grand Prix, and just outside the Hotel de Paris the needle-nosed Formula 1 race cars roared through the winding streets of Monaco. They whined. They spat fire. Each time a car blew by, the capillaries in my brain stood on end, did a frantic boogaloo, and fell back in a heap. The cars hurled past the belle époque buildings at the Place du Casino. Bronze angels and nude limestone voluptuaries, being deaf already, looked down in delight.

I slipped back into the calm of the hotel, and my eye locked on a diamond the size of a strawberry. It was on the hand of my new friend, a countess who lives in a suite at the hotel. I told her I was in need of bouchons pour les oreilles, literally “corks for the ears,” and asked her how she was enduring the races. She beamed. “I love the noise! You can feel how these men are wonderful.”

In Monaco no one does anything by half measures. It is a tiny, intensely developed Mediterranean nation dedicated to the principle of fabulous excess. Monaco is where the rich, the famous, the nouveaux riches, and the infamous all come to shelter their wealth from taxes and show it off for one another.

The countess, for example, was wearing the ring, three long strands of pearls, a gold bracelet of elephants joined trunk-to-tail, diamond earrings, a brooch, and a large gold pin holding her broad-brimmed hat in place. She was smoking a cigarette taken from a gold case. Her first husband collected Impressionists, she said, but her own tastes are simple: “I like jewels.” She stays at the Hotel de Paris partly for the refractive possibilities of the light flooding in through the lobby windows. “I want people to see my jewels,” she said. She was as happy as a child. “I like them to gleam.”

This is how it’s meant to be in Monaco, where everything that glitters is, if not gold, probably diamonds. “Does he still have the Jaguar with the matching dog?” I heard a woman inquire one day. “It was a Morgan,” her friend replied. “Cream colored.”

I asked one of them to teach me some French, and the phrase that came dancing gladly to her lips was “Il a du fric—He’s loaded.” I, on the other hand, couldn’t even open a savings account. Three different banks gently advised me that they had a $100,000 minimum.

“NATIONAL GEOGRAPHIC?” a British banker asked me one morning. “Why aren’t you in Papua New Guinea?” I started to lay out my idea that every nation has its own anthropology and that the native customs of Monaco are at least as exotic as those of any other hill tribe. The banker latched onto this idea instantly. “I go to this nightclub called Jimmy’z, and it’s like a ritual. Every night they play the same songs, and the same girls jump up and….” But he was leaping ahead of my story. To explain any natural hierarchy, it is necessary first to lay out the habitat.

The principality of Monaco is a 2.5-mile-long strip held snug against the Mediterranean by the steep, cup shape of the Maritime Alps. At its widest point, it stretches little more than a half mile from the sea.

Foreigners make up more than 80 percent of Monaco’s official population of 30,000. They flock to establish residence here because it has neither income nor inheritance taxes. So the pressure on real estate is intense. The buildings rise from below the waterline, up the faces of cliffs and over every remotely buildable swale and saddle of land. There is so little open space that new buildings have their lawns on the roof. Construction cranes pivot overhead, supplanting ornate 19th-century villas with concrete apartment towers. The result is an odd architectural mix: From the port Monaco resembles an amphitheater, and the sold-out crowd consists of seven-foot-tall basketball players dating demure old ladies with Chanel evening bags. The box seats high up at the corners of the amphitheater belong to Monaco’s elite. On the north side of the port is the Monte Carlo district, where the casino, lighted up at night like a birthday cake, first brought wealth to Monaco in the 19th century. On the south is the Rock, an Alpine ridge from which the palace of the Grimaldi family dominates the landscape. Everything in Monaco begins and ends with the palace. It is a natural cliff-top fortress. The
Grimaldis, originally from Genoa, first got inside when a 13th-century forebear posed as a Franciscan monk, then slaughtered the guards who opened the gates to give him alms. The family shield still features sword-bearing Franciscans over the motto “Deo Juvante—With the Help of God.”

“We’ve been here 700 years, the Grimaldis have,” said Prince Rainier III, when we met one afternoon at the palace. “So it must have been a good system for it to have survived so long.” He was talking about the strength and continuity of monarchy, an important topic for him now as the time draws near for the next generation to assume power.

Rainier, who has been sovereign since 1940, is a grandfatherly figure, shy, with soft blue eyes. He spoke with a formal British accent, one thumb against his temple, his fingertips stroking his brow pensively, a bit like the elderly Citizen Kane. He is best known for his marriage to the American actress Grace Kelly, who is still revered in Monaco 14 years after her death in a car crash. Their marriage and every indiscretion of their children, Caroline, Albert, and Stephanie, have been chronicled endlessly in People and Paris Match. Meanwhile, relatively unnoticed, Prince Rainier himself has gone about his business more like an entrepreneur than a monarch, shrewdly and sometimes ruthlessly reshaping the family business that is Monaco.

Questions

Main factual 2
Why do foreigners flock to establish residence in Monaco?
(a) To experience the principality’s nightclubs
(b) To watch the Grand Prix
(c) To take advantage of its lack of income and inheritance taxes

Main factual 1
What ritual was described by the British banker?
(a) Showing off wealth to one another
(b) Watching the Grand Prix
(c) Going to a nightclub

Title
Which of the following titles best fits the text?
(a) Monaco’s wealth and wealthy
(b) The racing and royalty of Monaco
(c) People and possessions in the principality of Monaco

Structure
Who does the author interview just before the description of Monaco’s size (2.5 mile long strip), location and population?
(a) Prince Rainier III
(b) A British banker
(c) The Countess

Incidental 1
How long have the Grimaldis been in Monaco?
(a) Since 1940
(b) Since the 13th century
(c) Since the 19th century
Main factual 3
What causes the odd architectural mix in Monaco?
(a) The dominance of the Grimaldi family palace
(b) The intense pressure on real estate
(c) The native customs of Monaco

Incidental 3
What did the Countess’ husband collect?
(a) Impressionists
(b) Diamonds
(c) Racing cars

Main idea
According to the author, what is Monaco dedicated to?
(a) The principle of fabulous excess
(b) Strength and the continuity of the monarchy
(c) Motor sport

Incidental 2
What is the author taught to say in French?
(a) Corks for the ears
(b) I like jewels
(c) He’s loaded

Please indicate with a tick or cross whether or not each of the following appeared in the text you read:
☐ One evening at dusk a full golden moon rose over the Mediterranean
☐ The cars hurled past the belle époque buildings at the Place du Casino
☐ In Monaco no one does anything by half measures
☐ Foreigners make up more than 80 percent of Monaco’s official population of 30,000
☐ A decent one bedroom apartment starts at $600,000
☐ To explain any natural hierarchy, it is necessary first to lay out the habitat
☐ I sipped my drink, and faces began to materialize out of the darkness
☐ But no one goes to Monaco to be unseen
☐ They keep an apartment for tax purposes but actually live elsewhere
☐ The box seats high up at the corners of the amphitheater belong to Monaco’s elite