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РЕФЕРАТИВНЫЙ ПЕРЕВОД (АНГЛИЙСКИЙ ЯЗЫК)

ПОСОБИЕ
для слушателей специальности переподготовки
1-21 06 74 «Современный иностранный язык (английский)»
вечерней формы обучения

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Настоящее пособие направлено на формирование у слушателей переводческой компетенции, развития умений смыслового и прагматического анализа текста, анализа первичного текста и реализации перевода и текста в зависимости от поставленной цели, т. е. реферативного или аннотационного перевода.

Для слушателей специальности переподготовки 1-21 06 74 «Современный иностранный язык (английский)».

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ПРЕДИСЛОВИЕ

В теории и практике перевода уже несколько десятилетий назад появилось представление о возможности и необходимости осуществления перевода, ориентированного на различные коммуникативные задачи, в связи с чем широкое распространение получили так называемые «неполные», или сокращенные, виды перевода. К ним относятся такие переводы, как аннотационный, аспектный, фрагментарный и реферативный. Все они предполагают неполную передачу содержания оригинала, допускающую пропуски и сокращения различной степени. Среди названных видов «неполного» перевода именно реферативный перевод заслуживает особого внимания, поскольку именно он является наиболее эффективным способом обработки первичного иноязычного текста, позволяющим ознакомиться с основным содержанием первоисточника.

Огромное количество иностранных работ, появляющихся как в печатном, так и электронном виде делает реферативный перевод особенно востребованным, поскольку полный перевод всех новых публикаций практически невыполним, к тому же далеко не всегда необходим. В связи с этим более чем закономерным нужно считать популярность и распространенность во всем мире специализированных реферативных журналов. Именно они служат средством оперативного оповещения специалистов о публикуемой в мире новой научно-технической литературе, и они же являются инструментом для ретроспективного поиска научных документов по соответствующим отраслям знания, проблемам и предметам.

Обучение «аннотированию», «аннотационному переводу, «реферированию» и «реферативному переводу» является неотъемлемой частью обучения иностранным языкам. Прежде всего такой вид работы практикуется в работе с текстами научно-технического и газетно-публицистического стиля. Аннотативный и реферативный перевод текстов - процесс обучения аналитической и творческой работе с текстами научно-технического характера, которая является продуктивным видом деятельности, способствующей развитию целого ряда практических навыков, необходимых для обработки информационных текстов большого объема, например, корректному обращению с информацией и переводческих навыков.

Пособие объединяет общеобразовательные и специальные учебные цели в обучении студентов неязыковых специальностей аннотационному и реферативному переводу. Обучение аннотационному и реферативному переводу научно-технической документации может в равной степени рассматриваться как самостоятельный модуль в рамках обучения письменному переводу, так и модуль в рамках системы преподавания английского языка как первого/второго иностранного, что и иллюстрирует данное пособие.

Одним из эффективных способов средств в обучении перевода научно-технической литературы является перевод литературы по смежной или незнакомой области, где выход из «зоны комфорта» обеспечивает корректное использование лексического, грамматического анализа и проявления творческого подхода в подаче необходимого материала в рамках реферативного перевода. Основной задачей обучаемого является умение грамотно, логично и связно предоставить перевод по средствам реферирования, поэтому сознательный лексико-грамматический анализ, понимания специфики текста гарантирует верный перевод смысла текста и передачу авторской мысли.

РАЗДЕЛ 1. РЕФЕРИРОВАНИЕ И АННОТИРОВАНИЕ КАК СПОСОБЫ ПЕРЕВОДА

Аннотирование и реферирование являются одной из наиболее широко распространенных письменных форм быстрого извлечения информации и ее смысловой обработки на продвинутом или даже завершающем этапе обучения иностранным языкам. Основой таких видов деятельности является исчерпывающее понимание иностранного текста, то есть навыки свободного перевода научно-технической литературы с листа.

Кроме хорошего знания иностранного языка для успешной работы по обработке текстов переводчику необходимо следить за специализированной научной литературой по проблемам, относящихся к области его специальности, а также свободно ориентироваться в иностранных публикациях, быть в курсе о современном состоянии рассматриваемых проблемы, обладать знаниями в ряде специфик охватывающих научную, политическую, экономическую, историческую области и т.д. Переводчику необходимо уметь отделять основную

информацию от второстепенной, анализировать и обобщать обрабатываемый материал.

Целью информационной обработки текста является извлечение полезной и ценной информации по конкретной проблематике, представляющей интерес для заказчика реферативного перевода. Сущность данной обработки текстов состоит в кратком изложении «первичного» текста.

Термин «первичный» и «вторичный» текст используются для классификации информационных документов. Вторичный текст создается в результате преобразования исходного, первичного текста. Аннотация, реферат, рецензия, конспект как раз относятся к типам вторичного текста.

ГЛАВА 1. РЕФЕРАТИВНЫЙ ПЕРЕВОД

1.1. Сущность реферирования

Реферирование иностранных источников, среди различных типов аналитико-сематической обработки первичных документов, является наиболее сложным по сравнению с реферированием и аннотирование источников на языке носителя. Реферативный перевод являет собой особый вид деятельности, при котором операции перевода тесно переплетаются с операциями по компрессии текста. Процесс обобщения материала при реферировании аналогичен процессу лексической трансформации при переводе. Одним из распространенных приемов обобщения - замена частного понятия общим, видового - родовым - аналогичен приему генерализации в процессе перевода. Подобные процессы трансформации и обобщения могут вызываться сугубо лингвистическими причинами: расхождением в смысловой структуре слов, которые обозначают одно и то же понятие в разных языках. Реферативный перевод одновременно включает межъязыковое преобразование и непосредственно реферирование, то есть свертывание информации. Языковые единицы вторичного документа замещают больший объем содержания, чем единицы текста оригинала.

Необходимым условием для реферирования является предварительное понимание первичного текста в целом. Только при этом условии переводчик будет способен отделить в тексте главную, существенную информацию и опустить второстепенную. Реферат рассмат-

ривается как новый, вторичный текст, создание которого определяется результатом осмысления и понимания содержания текста в целом.

Одним из важных навыков в инструментарии реферирования является умение разбития первичного текста на структурные единицы. Главными структурными единицами, превосходящие предложения, являются: абзац и группа абзацев, называемые субтекстом. Субтекст - компонент связанного текста, развивающий одну из главных его тем. Субтекст включает в себя вводный абзац, описательный абзац и абзац вводящий читателя в проблематику текста, выдвигая новую проблему, решению которой посвящен последующий текст статьи.

Большое значение для методики работы играет понимание смысловой структуры абзаца. Предложения, составляющие абзац, неравноценны с позиции их смыслового веса. Первое предложение, как правило, является более важным, нежели остальные. Оно содержит в себе информацию всего абзаца, т.е. обобщение смысла всего абзаца. Остальные предложения только развивают его. Подобные предложения называются ключевыми (key) предложениями или тематическими (topic sentences).

Таким образом умение находить ключевые предложения в абзаце позволяет ориентироваться в тексте, вычленить смысловые акценты и, следовательно, понять его смысловое содержание. Кроме того, умение предвидеть содержание текста обеспечивается за счет глобального подхода к изучению текста в целом.

1.2. Назначение и виды рефератов

Из своего этимологического значения слово реферат (от лат. *reffere* - сообщать, докладывать) - это краткое изложение содержания оригинала-первоисточника. Реферирование представляет собой интеллектуальный творческий процесс, включающий осмысление исходного текста, аналитико-синтетическое преобразование информации: описание текста, целевое извлечение наиболее важной информации, ее перераспределение и создание нового текста. Реферат позволяет определить, насколько необходимо обращаться к первоисточнику и с какой целью. Субъективная оценка может быть представлена оценочными элементами, напр., *нельзя не согласиться с мнением автора*, *автор удачно решает комплекс проблем* и др.

Существует несколько видов рефератов:

- индикативный - (реферат-резюме) максимально кратко излагает выводы, результаты проведенной работы, все второстепенное для интересующей референта темы опускается;
- информативный - (реферат-конспект) конспектированно излагает существенные положения первичного документа в обобщенном виде.

Информативный реферат подразделяется на два типа:

- монографический - реферат составленный по одному источнику и называется выборочным реферированием;
- обзорный - реферат на обширную тему по нескольким документам с краткой характеристикой содержания каждого из них по отдельности.

Индикативный реферат сходен с аннотацией в силу краткости и лаконичности изложения и служит для детерминирования целесообразности обращения тексту. Но, в отличие от аннотации, реферат-резюме в обобщенном виде раскрывает все основные положения первичного текста, излагает проблематику текста-источника и дает представление о фактах, результатах и выводах, изложенных в нем.

Объем реферата может варьироваться в зависимости от цели его дальнейшего использования: для цитирования в своей работе, при выработке новой концепции исследования и т.д. Однако, существуют три основных требования к реферату:

- информативность, полота изложения;
- объективность, неискаженное фиксирование всех положений текста;
- корректность в оценке материала.

Структурно реферат отличается своим постоянством:

1. **заголовочная часть** - формулировка темы;
2. **реферативная часть** - изложение основных положений первичного текста;
3. **анализ, изложение результатов и выводов** - указание на наличие иллюстративного материала (таблиц, рисунков, схем и т.д.);

4. **заключительная часть** - возможный комментарий, в котором переводчик-референт выражает свое мнение по отношению к проблемам, рассматриваемым в первоисточнике или мнению автора по этим вопросам.

При подробном рассмотрении структуры реферата, можно вывести точную его модель. По этому плану должен составляться реферат:

1. Вступление.

Задачи типового вступления:

- дать исходные данные (название исходного текста, где опубликован, в каком году);
- сообщить сведения об авторе (фамилия, ученые степень и звание, если есть);
- выявить смысл названия работы, чему посвящена (тема), в связи с чем написана.

2. Перечисление основных вопросов (проблем, положений), о которых говорится в тексте.

3. Анализ самых важных, по мнению референта, вопросов из перечисленных выше.

Задачи типового анализа:

- обосновать важность выбранных вопросов (почему эти вопросы представляются наиболее важными и интересными автору реферата);
- коротко передать, что по этим вопросам говорит автор, опуская иллюстрации, примеры, цифры, отмечая только их наличие;
- выразить свое мнение по поводу суждений автора исходного текста.

4. Общий вывод о значении всей темы или проблемы реферируемого текста.

В этой части реферата можно выйти за пределы данного текста и связать разбираемые вопросы с более широкими проблемами.

Если в статье отсутствует один из вышеприведенных пунктов, то его в реферате опускают, сохраняя последовательность изложения. Само изложение ведется по важности отобранных сведений: в концентрированной форме излагается суть вопроса, затем приводятся фактические данные. Замена конкретных данных общими не допускается. План составления реферата может не совпадать с планом написания реферируемой статьи. Реферат является единым, логически компактным изложением основного содержания статьи, поэтому, не имеет каких-либо разделов.

Самой существенной и отличительной чертой реферата является **информативность**. Именно эта черта является необходимой для экономии времени прочтения документа. Как правило, рефераты довольно часто заменяют первичные документы, особенно когда исходный текст составлен на иностранном языке.

Объемом реферативного сообщения определяется объемом первичного документа, нормами и практическим значением конкретного документа для его получателя. Средний объем - от 500 печатных знаков для индикативного типа реферата, 1000 печатных знаков для информативных рефератов, 2500-10000 знаков - для информативного типа. В случае важности высокой информативности, актуальности или труднодоступности информации первичного документа объем реферата может достигать 12000 печатных знаков.

1.3. Написание реферата

1.3.1. Определение характера информации

В научной литературе существуют три основных типа информации:

- фактографическая - информация о фактах, процессах, событиях, явлениях и т.д.;
- логико-теоретическая - сообщение о способах получения фактографической информации, выводов из фактов, ссылок на источник информации;
- оценочная информация - выражение авторского отношения к сообщению.

При компрессии текста необходимо отобрать информацию о фактах, а затем оценить необходимость логико-теоретической и оценочной информации.

1.3.2. Оценка значимости информации

В процессе обработки информации, переводчик сталкивается с фактом дублирующей информации. Дублирование информации состоит в повторении уже описанной информации по средствам других языковых средств.

В научной литературе зачастую это представляется в виде объяснения уже названного термина. При сокращении выбирается один из вариантов - термин или его объяснение. Если термин является общеупотребительным, то его объяснение опускается. В данном случае индикаторами дублирующей информации служат конструкции: *то есть, иными словами, иначе говоря* и т.д.

Дублирование информации обеспечивает связность текст, его смысловое развитие. Оно выражается в лексических, синонимических и местоименных повторах. При наличии дублирующей информации в смежных предложениях содержание одного предложения может включаться в другое в виде обособленного оборота (причастного или деепричастного).

1.3.3. Основная и дополнительная информация

Дополнительная информация конкретизирует и уточняет основную.

Ее включение в реферат зависит от цели реферирования и от объема знаний составителя по данной теме. Для выделения основной и дополнительной информации можно использовать следующие рекомендации:

1. Определить основную информацию помогает синтаксический анализ предложения. Надо выделить предикативный минимум – субъект и суждение о субъекте с пояснениями, необходимыми для сохранения смысла предложения.

2. Дополнительная информация в виде примеров, иллюстраций может вводиться словами: *например, так, так например, такие же*; конкретизирующая информация вводится союзным аналогом в частности.

3. Дополнительная информация может содержать перечисление предметов, явлений, фактов, конкретизирующих их обобщенные названия в основной информации.

4. Дополнительная информация уточняющего характера развивает основную информацию текста. Это выражается в повторяемости ключевых слов. Дополнительная информация часто содержит цифровые данные.

5. Для определения основной информации важно найти в тексте констатирующие тезисы и выводы. Аргументация тезисов и ход рассуждений, которые приводят к выводу, при сильном сокращении текста могут опускаться.

6. Тезис может вводиться в реферат со ссылкой на источник информации. При этом используются специальные средства оформления тезиса:

Автор	*считает* *полагает* *утверждает*
По мнению автора... *С точки зрения автора...* *Как утверждает автор...*	

7. Если аргументирующая часть не включается в реферат, то можно показать ее наличие в исходном тексте следующими способами:

Автор поддерживает свою точку зрения	*доказательствами* *аргументами* *примерами* *конкретными данными*
В подтверждение своей точки зрения автор приводит	*доказательства* *ряд доказательств* *аргументы* *результаты наблюдений*

8. При сокращении текста за счет той части, где говорится о наблюдениях, исследованиях, рассуждениях, которые привели к выводу, можно использовать следующие специальные средства:

Наблюдения приводят/привели к выводу…	
Полученные данные *Рассуждения*	*позволяют/позволили сделать вывод…*

Анализ результатов свидетельствует…		
На основании	*выполненных исследований* *проведенных наблюдений* *полученных данных* *анализа результатов*	*был сделан вывод…* *можно сделать вывод…* *автор приходит/пришёл к выводу…* *автор делает вывод…*

1.3.4. Синтаксическая конденсация текста

Синтаксической конденсацией является передача первоисточника экономными средствами:

Исходный текст	**Перевод исходного**	**Реферат**
If heated, without air the properties of phosphorus will change dramatically after a while: The phosphor becomes red-violet, ceases to glow in the dark, becomes non-toxic and does not self-ignite in air.	Если нагреть фосфор без доступа воздуха, то через некоторое время его свойства резко изменятся: фосфор приобретает красно-фиолетовый цвет, перестает светиться в темноте, делается неядовитым и не самовоспламеняется на воздухе	*Описываются* изменения свойств фосфора при нагревании без доступа воздуха.
Economic and geographical research is of paramount importance for the development of the national parks network.	Экономико-географические исследования имеют исключительное значение для развития сети национальных парков.	*Подчеркивается* значение экономико-географических исследований для развития сети национальных парков.

В реферативных текстах отношения обусловленности чаще всего выражаются простыми предложениями с предикатами: *обусловливать(ся) чем?, определять(ся) чем?, вызывать(ся) чем?. приводить что?, обеспечивать что?, позволять что?, свидетельствовать о чем?*

1.3.5. Использование цитат

В реферате могут быть использованы цитаты из реферируемой работы. Они всегда ставятся в кавычки. Следует различать три вида цитирования, при этом знаки препинания ставятся, как в предложениях с прямой речью:

1. Цитата стоит после слов составителя реферата. В этом случае после слов составителя реферата ставится двоеточие, а цитата начинается с большой буквы. Например:
Автор статьи утверждает: «В нашей стране действительно произошел стремительный рост национального самосознания».
2. Цитата стоит перед словами составителя реферата. В этом случае после цитаты ставится запятая и тире, а слова составителя реферата пишутся с маленькой буквы. Например:
«В нашей стране действительно произошел стремительный рост национального самосознания», - утверждает автор статьи.
3. Слова составителя реферата стоят в середине цитаты. В этом случае перед ними и после них ставится точка с запятой. Например:
«В нашей стране, - утверждает автор статьи, - действительно произошел стремительный рост национального самосознания».
4. Цитата непосредственно включается в слова составителя реферата. В этом случае (а он является самым распространенным в реферате) цитата начинается с маленькой буквы. Например:
Автор статьи утверждает, что «в нашей стране действительно произошел стремительный рост национального самосознания».

1.3.6. Языковые клише

Необходимой частью в составлении реферата являются языковые средства или языковые клише. Данные средства помогают переводчику не только сделать реферат «насыщеннее», но логически связать каждую из логических частей реферата. Ниже приведен список возможных клише для составления реферата исходного текста:

Смысловые компоненты текста	Языковые средства выражения (клише)
1. Тема и название статьи	Данная, настоящая, рассматриваемая статья … Статья называется, носит название, озаглавлена… Тема статьи…; Данная статья посвящена теме…; Статья написана на тему о …; В статье говорится о …; Автор статьи рассказывает о …
2. Проблематика статьи	В статье рассматривается, ставится вопрос о том, что …; В статье автор касается вопросов о…; Автор затрагивает, ставит, освещает вопрос о …; автор говорит о проблемах …; останавливается на следующих вопросах (проблемах)… В статье излагается, представлена точка зрения, обобщается опыт работы …; дается анализ (чего), дается оценка (чему), дается описание (чего), научное обоснование (чего)
3. Композиция статьи	Статья делится на …, состоит из …, начинается с В статье можно выделить вступление, основную часть и заключение. Статья состоит из глав, частей, разделов. Во вступительной (первой) части говорится о…, ставится вопрос о том, что…, излагается история вопроса, речь идёт … Во вступительной части статьи, в предисловии к статье речь идёт о … В основной части статьи дается описание…, дается анализ, излагается точка зрения на …, дается характеристика (чего). В основной части значительное (большое) место отводится (чему); большое внимание уделяется (чему); основное внимание обращается (на что). В заключительной части, в заключении подводятся итоги исследования; делается вывод, обобщается сказанное выше; дается оценка (чему); В заключении подчеркивается (что); Статья заканчивается (чем).

4. Сравнение различных точек зрения	Существует несколько точек зрения по данной проблеме; Можно остановиться на нескольких основных точках зрения по данному вопросу. Одна из точек зрения заключается в том, что…; вторая точка зрения противостоит первой. Если первая утверждает, что …, то вторая отрицает это. Третья точка зрения высказана (кем) в статье (какой)… Мы разделяем третью точку зрения, приведенную здесь. С этой позиции мы попытаемся рассмотреть реферируемую статью.
5. Сообщение о наличии основной информации в авторском тексте	Автор статьи называет, описывает, анализирует, рассматривает, разбирает, доказывает, раскрывает, утверждает, подтверждает (что). Автор статьи сравнивает, сопоставляет (что, с чем); противопоставляет (что, чему); критически относится (к чему). В статье называется, описывается, анализируется, доказывается, рассматривается, утверждается (что); опровергается, характеризуется (что, как, каким образом); сравнивается (что, с чем); противопоставляется (что, чему). В статье дан анализ, дается характеристика, приводятся доказательства (чего). В статье приводятся сравнения, сопоставления (чего, с чем); приводится противопоставление (чего, чему).
6. Основание для доказательства, утверждения, соответствия или противоречия	Это доказывает, подтверждает то, что …; это соответствует, противоречит тому, что … На этом основании автор считает, утверждает, доказывает, что … Автор опирается на факты, на то, что …; объясняет это тем, что …; исходит из того, что…
7. Описание основного содержания авторского текста	В статье высказывается мнение о том, что …; представлена, высказана точка зрения (на что); доказано, что… В статье содержатся спорные, дискуссионные положения, противоречивые утверждения, обще-

	известные истины. В статье имеются ценные сведения, важные неопубликованные данные (о чем), убедительные доказательства (чего).
8. Включение дополнительной информации в авторский текст	Важно отметить, что …; необходимо подчеркнуть, что…; надо сказать, что …
9. Сообщение о согласии или несогласии	А) Согласие: Мы разделяем мнение автора статьи по вопросу о том, что …; стоим на сходной с ним точке зрения на то, что …; согласны с ним в том, что … Следует признать достоинство (чего) … Следует признать необходимым, важным, полезным, интересным, убедительным, оригинальным, достойным внимания (что)… Представляется важным, убедительным, интересным, оригинальным утверждение, вывод о том, что … Нельзя не согласиться с тем, что …; нельзя не признать того, что …; нельзя не отметить того, что… Б) Несогласие: Хотелось бы возразить (кому, на что); хотелось бы выразить сомнение (по поводу чего) …; хочется возразить автору по вопросу о … Вызывает сомнение утверждение о том, что …; вызывает возражение то, что … Позволим себе не согласиться с автором в том, что…; позволим себе возразить автору на то, что …; позволим себе выразить сомнение по поводу того, что … Мы стоим на противоположной точке зрения по вопросу о том, что ...; не разделяем мнения автора о том, что …; расходимся с автором во взглядах на вопрос о том, что … Сомнительно, что …; непонятно (что, почему, как).

10. Оценка	А) Элементы положительной оценки: Автор подробно описывает, рассматривает, характеризует (что); останавливается (на чем). Автор широко иллюстрирует, убедительно доказывает, подробно исследует (что); подтверждает выводы примерами; подтверждает основные положения фактами. Б) Элементы отрицательной оценки: Необходимо отметить следующие недостатки; (что) представляется недосказанным, малоубедительным, сомнительным, непонятным. Автор вступает в противоречие (с чем), противоречит (чему); необоснованно утверждает (что). Автору не вполне удалось показать, доказать, раскрыть (что).
11. Адресат статьи (опциональный смысловой компонент)	Статья (книга) адресована специалистам / неспециалистам, широкому кругу читателей. Статья рассчитана (на кого), интересна (кому), представляет (может представлять) интерес (для кого).

В заключение рассмотрим порядок написания реферата с учетом вышеупомянутых методов составления. Для этого необходимо:

- прочитать текст и составить его план (с учетом перераспределения информации);
- выявить основную и дополнительную информацию;
- выделить основную информацию: определить тему текста, микротемы, известную (данную) информацию, новую информацию;
- выписать к каждому пункту плана ключевые слова и выражения, необходимые для изложения его смыслового содержания;
- переформулировать основные положения текста, используя экономные способы передачи информации;
- отобрать языковые средства (клише), оформляющие реферат;
- на основе полного анализа и отобранного языкового материала написать реферат.

ГЛАВА 2. АННОТАТИВНЫЙ ПЕРЕВОД

Аннотирование - процесс составления кратких сведений о первичном тексте, который позволяет судить о целесообразности его детального изучения в дальнейшем. Аннотацией (от лат. *annotatio* - замечание) является максимально краткое изложение того, о чем можно прочесть в первичном тексте. Здесь перечисляются главные проблемы, изложенные в исходном тексте, а также может характеризоваться его структура.

Как было указано ранее, в отличие от реферата, аннотация не раскрывает содержание документа, конкретные данные и т.д., она дает общее представление о содержании первичного текста. Аннотация дает информацию по интересующему вопросу.

Существуют следующие виды аннотаций:

- справочные (описательные) - наиболее обобщенная характеристика материала;
- рекомендательная - оценка первичного текста и рекомендация по его использованию;
- общая - рассчитана на широкий круг пользователей, содержащая характеристику на первичный текст в целом;
- специализированная - рассчитана на узкий круг пользователей, рассматривающая определенные аспекты документа;
- аналитическая - описывает определенные части первичного документа, затрагивающие конкретную проблему.

Как правило, самым распространенным является справочный (описательный) тип аннотации, наиболее оптимально подходящий для научно-технической документации.

2.1. Структура аннотаций

Аннотация состоит из трех частей:

- вводная - рассматриваются все необходимые данные первичного текста: перевод заглавия статьи; заглавие на языке оригинала; фамилия и инициалы автора; название издания, год, том, номер или дата выпуска, страницы, язык публикации;

- описательная - в которой описываются два, три или более основных положения исходного текста;
- заключительная - приводятся конкретные особенности изложения содержания источника;

Аннотация не должна повторять заглавие первоисточника, а наоборот, раскрыть его. Для составления аннотации следует придерживаться определенных требований:

- Аннотации должны быть составлены так, чтобы их содержание было доступно для усвоения при первом же прочтении, в то же время должны быть отражены все наиболее важные моменты первоисточника.
- Аннотации должны отражать научную информацию статьи и не содержать субъективных взглядов автора.
- Язык аннотации должен быть лаконичным, точным и в то же время простым. При составлении следует избегать избыточности информации, ее повторения, вводных и сложных придаточных конструкций.
- В текст аннотаций часто вводятся неопределенно-личные местоимения и страдательно-возвратные конструкции типа: сообщается, описывается, излагаются и т.д.
- Употребление терминологии, сокращений, условных обозначений в аннотациях должно соответствовать нормам, принятым в конкретной области знаний.

Допустимым объемом аннотации является лимит в 500 печатных знаков. Справочные (описательные) типы не должны превышать ограничение в 800-1000 печатных знаков.

2.2. Алгоритм составления аннотации

Есть несколько алгоритмов по составлению аннотаций. Рассмотрим некоторые из них:

При составлении описательного типа:

- просмотрите текст с целью получения общего представления о тексте в целом;

- выделите абзацы, содержащие конкретную информацию по теме статьи, методу проведения работы, результатом работы, применению в конкретной области;
- сократите малосущественную информацию в этих абзацах по каждому пункту;
- напишите обобщенную основную в форме реферата в соответствии с планом его написания: тема, метод, результаты, выводы, применения.

При составлении библиографического описания:

- укажите заглавие реферируемой статьи на русском языке и языке оригинала;
- если есть автор или авторы, напишите их на языке оригинала (помните, что если авторов больше двух, указывается только первый и затем пишется «и др.»);
- затем напишите название источника информации на языке оригинала, год, номер, обязательно страницы;
- только затем пишется текст аннотации или реферата.

ГЛАВА 3. ТЕКСТЫ ДЛЯ АННОТАЦИОННОГО И РЕФЕРАТИВНОГО ПЕРЕВОДА

Текст 1. RADIATION DANGERS

Radioactivity is dangerous. It may cause skin bums and it may destroy good tissues, as it destroys the diseased ones. It may cause illness that could be passed to our children and grandchildren. In cases of severe exposure it may even cause death.

In the early days of radioactivity scientists were not aware of those dangers. Marie and Pierre Curie after having worked for a while with radioactive materials, noticed that their fingers were reddened and swollen, and that the skin was peeling off. Becquerel carried a small tube with radium in it in his waistcoat pocket and was surprised to find a burn on his chest. Other early workers also reported burns and injuries of various kinds.

The strange fact about radiation is that it can harm without causing pain, which is the warning signal we expect from injuries. Pain makes us pull back our hands from flame or a very hot object but a person handling radioactive materials has no way of telling whether he is touching something too “hot” for safety. Besides, the burns or other injuries that radioactivity produces may not appear for weeks.

Today scientists are aware of these dangers. They are steadily finding now means of protecting themselves and others from radioactivity. It may well be that in the race between production of radioactivity and production of means of protection, the second will be the winner.

Our modern atomic laboratories are built for safety. Their walls are very thick, the rooms in which radioactivity is handled are separated from others by heavy lead doors. Large signs reading “Danger — Radiation” indicate the unsafe parts of the buildings. Counters and other instruments are continuously measuring the radiation, and give off special signals when it becomes too strong. Each worker carries a special badge that shows the amount of radiation he has been exposed to.

In the room in which radioisotopes are separated and handled, workers may wear plastic clothes that look like divers suits. They may handle the material under water with long tools; water is known to stop the radiation and protect the workers.

All radioisotopes are prepared by some method of remote control. They are placed inside heavy lead containers, through which the radiation cannot pass, and shipped to where they are to be used.

Текст 2. The parts of a computer

The computer is a universal information processing machine. The installation of computers in certain organizations has already greatly increased the efficiency of these organizations. Computers are a million times faster than humans in performing computing operations.

Analogue and digital computers are now widely used in many fields. A computer receives, stores, compares, changes, and manipulates data. A computer program is a set of instructions that tells a computer what to do. A program is also known as software.

There are three basic steps in handling data: input — entering data and instructions that enable the computer to do a specific job; processing — sorting data and doing calculations; and output — sending the results of processing to a storage or display device.

Software is the set of instructions that tells the computer what to do. Hardware is the physical parts of a computer, including peripherals.

A computer receives your input through the keyboard, disk drive, and other parts that you use to give it data or instructions.

Processing includes sorting, calculating, and other steps involved in following your instructions.

The information that results from the processing is called output. The computer displays output on its screen and can print the output or store it on disks.

The central processing unit, or CPU, is the computer's "brain". It has a control unit and an arithmetic/logic unit. The control unit determines whether the arithmetic/logic unit will add, subtract, or compare the numbers it was given.

A single silicon chip can be the entire CPU of a microcomputer. A chip contains thousands of tiny, interconnected electrical circuits.

A computer's ROM is not affected when you turn off the computer. ROM includes built-in instructions that tell the machine what to do when you turn it on and how to perform calculations.

RAM is a temporary memory that holds your input while you are working with it.

Текст 3. Nuclear Energy

One of the most spectacular- and controversial- achievements of the United States science and technology has been the harnessing of nuclear energy. This achievement was based on scientific concepts developed since the beginning of the 20th century. The idea of nuclear fission can be traced back to the work of Lord Rutherford and Frederick Soddy between 1901 and 1906. The two British scientists studied the makeup of the atomic nucleus and concluded that a great store of energy was locked in each nucleus. Soddy suggested that someday that enormous energy might be released. Fear that such an atomic war might occur swept through the international scientific community in 1938. Word leaked out that German scientists Otto Hahn and Fritz Strassmann had split a uranium nucleus by bombarding it with subatomic particles. Other nuclear physicists soon realized the significance of this event. In such a reaction, the splitting of each nucleus would release particles to split other nuclei. The result would be a tremendous release of energy. Albert Einstein, Enrico Fermi and others concluded that a nuclear chain reaction was achievable. But Einstein and Fermi had fled to the United States to escape persecution in National Socialist Germany and Fascist Italy. And they feared that the Nazis would develop an atomic bomb. Einstein explained that the element uranium might be turned into a great source of energy. He warned that extremely powerful bombs of a new type may thus be constructed. This warning led to the Manhattan Project- the United States' effort to build an atomic bomb. Milestones in this effort included achievement of the world's first self-sustaining nuclear chain reaction by Enrico Fermi at the University of Chicago in December 1942. Another milestone was the explosion of the first atomic bomb at Trinity Site, New Mexico, on July 16, 1945.

But new developments in science and technology often trigger opposition. Opposition to nuclear power has been a very different story. The first commercial atomic power plant started operation in Illinois in 1956. At that time it was widely predicted that nuclear power plants would supply nearly all of the nation's electricity by the 1980s. That did not happen. Opposition to the construction of nuclear plants has tended to increase rather than decrease. Safety and environmental considerations have kept construction costs high. As a result, nuclear power has not been able effectively to compete with other power sources in the United States. During the 1970s and 1980s, plans for several power plants were cancelled. Some plants under construction were abandoned and a few existing plants were

closed. Much of the American opposition to nuclear power is based on environmental and personal safety concerns. On top of that, Americans emotionally link nuclear power to nuclear weapons and to the great scientific effort that produced them both.

Since World War 2, Americans have debated the benefits of scientific progress. On one hand, science and technology have given Americans a high standard of living, greater longevity than ever before and exciting achievements in space exploration. Various successes in developing peaceful uses of atom-nuclear power, nuclear medicine and a new understanding of physics-have demonstrated man's creative use of this scientific breakthrough. On the other hand, science and technology have produced the dangers of radioactivity, toxic wastes, environmental disruptions and the threat of nuclear weapons. Americans are responding to these concerns on a variety of fronts, including international arms control negotiations, environmental protection laws, development of long-term disposal sites in remote areas for nuclear wastes and creation of a "Superfund" program to clean up dangerous chemical waste sites that threaten health.

Текст 4. SOLAR ENERGY

Shortage of energy is a major world problem and experts predict that the present rate of increase in energy can exhaust the supply of fossil fuels in the twenty-first century. What the world needs is a source of perpetual energy.

Potentially, we have a source of perpetual energy shining down on us. The sun. On clear day in the tropics, the intensity of solar energy can be more than a kilowatt per square meter at midday. That amount of energy falling on an area of sixty-four square kilometers is about as much as the whole of the British electricity generating system produces.

There is no charge for the energy that flows so freely from the sun. Unfortunately its collection and storage can be both difficult and expensive. Some form of storage is necessary because the sun's rays do not reach us on cloudy days or at night. Nevertheless, solar energy is now an economic and practicable solution.

It is possible to convert solar energy directly to electricity by the use of photoelectric cells but for most practicable purposes this is too expensive. Today's solar energy systems are of two types, based on the flat plate collector and the focussing collector. The flat plate collector is simpler and

cheaper. In its simplest form, the sun's rays fall onto a panel carrying water pipes. The sun heats the water, which is then available for use.

Текст 5. Russia charges U.S. report on human trafficking is biased

By Los Angeles Times

Russia fired back Monday after the United States put it on a watch list for human trafficking for the ninth year in a row, saying the American government's report was biased and driven by politics.

The Russian Foreign Ministry said the report is soft on the U.S. and its allies, painting them as "straight-A students" while vilifying its opponents, RIA Novosti reported.

"The United States has been and remains the world's largest human trafficking 'importer,' " Foreign Ministry spokesman Alexander Lukashevich wrote on Twitter, calling the report a "politically motivated document" that was meant to back up greater spending on human rights abroad..

According to the annual U.S. State Department report, released last week, forced labor and sex trafficking of Russians taken abroad and foreigners brought to Russia have continued, The report also cites anecdotal reports of "signs of forced labor" at construction sites for the 2014 Winter Olympics in Sochi, Russia.

Though Russia has come up with a plan to combat the problem, so far "the government has not shown evidence of increasing efforts to address human trafficking," the State Department said. Trafficking victims have little protection in Russia, the report says.

The report divides countries into four categories based on what they have done to try to eliminate the problem; Russia landed in the second-lowest category, a watch list that also includes Afghanistan, China and Lebanon. The United States was in the top category, with the report saying that although trafficking occurs in this country, including "increasing reports of children recruited into criminal activity," the U.S. "fully complies with the minimum standards for the elimination of trafficking."

Lukashevich singled out the anecdotal claim of forced labor at the Sochi construction sites, saying it "confirms this document's generally biased and politicized nature," according to the Interfax news agency.

That complaint fell flat with one organization that fights human trafficking. Russia has done little in the face of "obvious evidence" that as

many as a million people are exposed to exploitative labor conditions, said Not for Sale, a California-based group that aims to combat human trafficking and slavery.

"Russia is choosing to publicly politicize their critique of the [State Department] report rather than recognize their responsibility as a government to address the real problems that are going on, and their inaction to address them," Not for Sale President David Batstone said in a statement Monday.

Текст 6. 'Undead' genes come alive days after life ends

Does death really mean the end of our existence? Great thinkers from Plato to Blue Öyster Cult have weighed in on the question. Now, a study shows that at least one aspect of life continues: Genes remain turned on days after animals die. Researchers may be able to parlay this postmortem activity into better ways of preserving donated organs for transplantation and more accurate methods of determining when murder victims were killed.

Before you ask, microbiologist Peter Noble of the University of Washington, Seattle, and colleagues were not trying to find out what allows zombies to stalk Earth and slurp the brains of the unwary. Instead, the scientists wanted to test a new method they had developed for calibrating gene activity measurements. Their research had already taken a morbid turn—2 years ago they published a paper on the abundance of microbes in different human organs after death—and they decided to apply their method to postmortem samples. "It's an experiment of curiosity to see what happens when you die," Noble says.

Although scientists analyzing blood and liver tissue from human cadavers had previously noted the postmortem activity of a few genes, Noble and colleagues systematically evaluated more than 1000. The team measured which of these genes were functioning in tissues from recently deceased mice and zebrafish, tracking changes for 4 days in the fish and 2 days in the rodents.

At first, the researchers assumed that genes would shut down shortly after death, like the parts of a car that has run out of gas. What they found instead was that hundreds of genes ramped up. Although most of these genes upped their activity in the first 24 hours after the animals expired and then tapered off, in the fish ***some genes remained active 4 days after death.***

Many of these postmortem genes are beneficial in emergencies; they perform tasks such as spurring inflammation, firing up the immune system, and counteracting stress. Other genes were more surprising. “What’s jaw-dropping is that developmental genes are turned on after death,” Noble says. These genes normally help sculpt the embryo, but they aren’t needed after birth. One possible explanation for their postmortem reawakening, the researchers say, is that cellular conditions in newly dead corpses resemble those in embryos. The team also found that several genes that promote cancer became more active. That result could explain why people who receive transplants from the recently deceased have a higher risk of cancer, Noble says. He and his colleagues posted their results on the preprint server bioRxiv last week, and Noble says their paper is undergoing peer review at a journal.

“This is a rare study,” says molecular pharmacologist Ashim Malhotra of Pacific University, Hillsboro, in Oregon, who wasn’t connected to the research. “It is important to understand what happens to organs after a person dies, especially if we are going to transplant them.” The team’s approach for measuring gene activity could be “used as a diagnostic tool for predicting the quality of a transplant.”

In an accompanying paper on bioRxiv, Noble and two colleagues demonstrated another possible use for gene activity measurements, showing that they can ***provide accurate estimates of the time of death***. Those results impress forensic scientist David Carter of Chaminade University of Honolulu. Although making a time of death estimate is crucial for many criminal investigations, “we are not very good at it,” he says. Such estimates often rely on evidence that isn’t directly connected to the body, such as the last calls or texts on the victim’s cellphone. Noble and his colleagues, Carter says, have “established a technique that has a great deal of potential to help death investigation.”

A mouse or zebrafish doesn’t benefit, no matter which genes turn on after its death. The patterns of gene activity that the researchers observed may represent what happens when the complex network of interacting genes that normally keeps an organism functioning unwinds. Some genes may turn on, for example, because other genes that normally help kept them silent have shut off. By following these changes, researchers might be able to learn more about how these networks evolved, Noble says. “The headline of this study is that we can probably get a lot of information about life by studying death.”

Текст 7. Quantum Computing

The promise of quantum computing seems limitless—faster internet searching, lightning-quick financial data analysis, shorter commutes, better weather prediction, more effective cancer drugs, revolutionary new materials, and more. But we're not there yet. Focusing on narrow benchmarks, such as how many quantum bits, or qubits, the latest computers have (not many), creates a myopic snapshot of a vast technical landscape. The goal goes beyond faster computers to encompass innovations spread broadly across quantum information science, materials, and technologies, such as quantum sensors—a wide field indeed.

Focusing narrowly on computing won't accelerate the arrival of quantum supremacy—the tantalizing promise of a future when quantum computers surpass classical computers in computational tasks of practical importance. That will come only from wide-spectrum research and development spanning fundamental quantum mechanics, information science, materials science, computer science, and computer engineering, among other fields.

The best approach puts science first. Solving basic science problems in quantum science across all its complexities will lay the foundation for an array of future technologies and enable transformative scientific and industrial progress. And make no mistake, those technologies will be major drivers of scientific advancement, the economy, and even national security.

Some day.

To say quantum computing is in its infancy is an overstatement. It's still in the womb. The field is sorting out basic questions about the architectures and technologies for creating and controlling qubits. Qubits are the fundamental processing units of quantum computers, and regardless of the method used to make them, they still don't maintain their "quantumness" long enough to perform tasks much beyond proof-of-concept computations.

The challenge is built into the inherent weirdness of quantum physics itself, which has puzzled the world's most brilliant minds for more than 100 years. Basic questions about how particles behave in the subatomic realm—behavior that enables quantum computing—remain unanswered. The eventual answers will fill in huge blank spots in our understanding of the most fundamental workings of the universe.

That's also what makes quantum science so exciting.

Lacking answers, scientists still debate what makes a quantum com-

puter quantum. Are the conditions of entanglement, superposition, and interference all required? Entanglement is touted as the key ingredient, but that has not been proven. It appears indispensable in some cases, but not in others.

Entanglement occurs when multiple particles can only be described by a global, not an individual, state. This is analogous to reading a book where the individual pages make no sense, but where information emerges once you're read them all. Normal computers struggle mightily to represent entanglement, which severely limits their ability to simulate quantum systems, like pharmaceutical drugs or superconducting materials. This is one reason we need quantum computers.

Superposition stems from the wave-particle duality of elemental particles in the quantum realm, such as electrons, photons, ions, and atoms. Each is a wave function of probabilities regarding its observable state, such as position, spin, polarization (for a photon), or angular momentum. A particle, or qubit, can occupy many states at once. Those states can be "read" much like reading a classical-computing bit as 0 or 1, but a qubit has many more potential values corresponding to the simultaneous probabilities of being 0 or 1. That property speeds up computation.

Decoherence, the nemesis of quantum computing, strikes when environmental factors break down the quantum state. Loosely described as "noise," those factors include entanglement with the external environment or heat. Measuring the value of a qubit also collapses the wave function, and the qubit has to be set up again, like pressing the "clear" button on a calculator.

Because we still do not fully understand how all this works, large-scale quantum computing will remain elusive as science delves deeper into the quantum world. Science is rooted in theory, which must then be observed by experiment, which then refines theory and generates more experiments. As results solidify, practical applications emerge in technology.

In quantum research, for example, we have already seen that scenario emerge in the case of the no-cloning theorem. Formulated by Wojciech Zurek, of Los Alamos National Laboratory, and William Wooters, formerly of Williams College, in the early 1980s the theorem states that an unknown quantum state cannot be exactly copied. In recent years, Los Alamos has developed a quantum-key distribution device based on this principle for creating hack-proof communications, a major step forward in cybersecurity.

That is one example of how basic science research ultimately spawns

technology. Zurek continues his theoretical work in quantum mechanics and is currently studying the breakdown of quantum coherence of space time near a black hole. Such pure-science work does not address a technology challenge, but it might someday shed light on why decoherence cripples the particles making qubits in quantum computers.

Closer to home, even today's limited quantum computers are a great place to test theory by simulating quantum physics, since they establish exactly the conditions we wish to study. That capability will advance physics in areas stalled by the limits of classical computing and help answer fundamental physics questions.

So, for example, one project at Los Alamos using a cloud-based, publicly available quantum computer seeks to observe how classical behavior—the reliable determinism we observe in our everyday world—emerges from quantum probabilities. The quantum-classical transition remains one of the great unsolved mysteries in science. It has direct bearing on why quantum computers lose coherence and how we can create durable qubits that maintain coherence long enough for extended calculations, paving the way for large-scale quantum computers.

On another front, research into quantum materials is vital to developing robust quantum computers and a constellation of other technologies. Across the board, the ultimate goal is to create particular, controllable quantum states that we can manipulate. That requires isolating qubits from their environment to prevent unwanted entanglement.

The various architectures being explored for quantum computing depend on different ways of creating qubits. Some computers use the states of super-cold trapped ions, while others use superconducting loops. New research is exploring qubits in defects, or voids, on the surface of solids, such as diamond crystals or atomically thin semiconductors. The work seeks to precisely place these defects where they are needed, offering a path toward controllable quantum states, robust qubits, and circuits of qubits in solid materials at room temperature—a challenging but seemingly attainable goal.

Other research exploits superposition to create quantum "atomtronic" (versus electronic) sensors that precisely detect rotations, acceleration, electromagnetic fields, and the like. The next step is exploiting entanglement. Then a particle needs to hit only one atom of the detector to collapse the superposition and—click! —record a measurement. Related research has "painted" matter-wave guides that work like fiber-optic circuits but are much more sensitive. They could be used to create an "atomtronic" gyro-

scope, which might one day enable navigation independent of GPS systems.

While theory and basic research march forward and tech giants press ahead exploring the fundamental architecture of quantum computers, the key to extracting their full potential will be algorithms, the set of instructions that tell the computer what to do. They must exploit the unique features of quantum computers without succumbing to the inherent tiger traps of the quantum world. While evidence is highly suggestive, we do not yet know which classes of algorithms may be uniquely enabled by quantum computing.

In work typical of the synergy among quantum theory, quantum information science, and computing, scientists at Los Alamos have adapted algorithms from condensed-matter physics to a new purpose: discovering and developing robust algorithms for the noisy and problematic small-scale quantum computers available today. Related research applies quantum machine learning, an exotic strategy where the quantum computer itself learns to adapt its own algorithms, to perform accurate calculations in spite of its noise.

Quantum computing gets the lion’s share of media attention because of the extravagant claims for its potential: it will render current cybersecurity systems obsolete, it will process vast streams of data in the blink of an eye, it will enable artificial intelligence to surpass human intelligence. Some of that might come true, some might not. Only a firm commitment to broad-based quantum research will tell. In any case, that research will lead to unexpected insights, new solutions to old challenges, and surprising benefits to national economic competitiveness, national security, and everyday life.

Текст 8. Black Holes

A black hole isn't truly a hole. It's quite the opposite. A black hole is a place in space containing an enormous amount of mass packed very tightly together. And it has the capacity to draw in more mass all the time. These objects have so much mass — and therefore gravity — that nothing can escape them, not even light. That makes them some of the most extreme objects in the universe.

And they aren’t just massive, but also dense. Density is a measure of how tightly mass is packed into a space. Imagine a black hole the size of New York City. It would have as much mass and gravity as our sun.

Most black holes form after a giant star, one at least 10 times as massive as our sun, runs out of fuel and collapses. The star shrinks and shrinks and shrinks. Eventually, it forms a tiny dark point. This is known as a stellar-mass black hole. Now much smaller than the star that made it, this black hole still has the same mass and gravity.

Our galaxy the Milky Way may have some 100 million such black holes. Astronomers estimate a new one forms every second. (Note that small- and medium-sized stars, such as the sun, cannot form black holes. When they run out of fuel, they just become small, planet-sized objects called white dwarfs.)

Stellar-mass black holes may be common, but they also are relative shrimps. At the other end of the spectrum are giants. Called supermassive black holes, they may have as much mass as a million — or even a billion — stars. These rank among the most powerful objects in the known universe. And their gravity holds together the millions or billions of stars that form a galaxy. In fact, a supermassive black hole called Sagittarius A* holds together our galaxy. It was discovered more than 40 years ago.

As nothing can escape a black hole — not visible light, X-rays, infrared light, microwaves or any other form of radiation — black holes are invisible. So astronomers have had to "observe" them by studying how they affect their surroundings.

For example, black holes often form powerful, bright jets of gas and radiation that are visible to telescopes. Physicists can use the size of that jet to estimate the size of the black hole responsible for the jet.

Jonelle Walsh is an astronomer at Texas A&M University in College Station. Astronomers continue to find and observe more black holes all the time. Several years back, Walsh told *Science News for Students*: Those observations can help untangle the complicated relationships black holes have with stars, galaxies and clusters of galaxies. One day, she explains, that research "will push us toward understanding how everything [in the universe] works together and forms and grows."

Текст 9. Computer languages

There are many different computer languages: BASIC, Pascal, Logo, FORTRAN, COBOL, and others. For every computer to understand one of these languages, it needs a translator for that language.

Why are there different computer languages? The reason for this is that different languages work well for different kinds of tasks.

A machine language is the natural instruction set of a computer which bears little resemblance to the algebraic form in which mathematical expressions are normally written. This language makes the operation of the computer possible. It is known as the binary number system and was originally used to represent and handle numbers only. Nowadays it is used to handle letters and symbols as well.

Binary (bi means two) system uses only two symbols, 1 and 0, rather than the ten decimal numbers (0 —9), and the twenty-six letters, we normally use.

The decimal numbers are compared with the corresponding binary symbols. The symbol 1 in the binary system can be used to represent one, two, four, eight, or sixteen depending on its position or place in a special chart.

The binary system is not so practical for ordinary numerical problems as the decimal system because more digits are required to express numbers. But this system suits modern computers because some of them can store more than one and a half million decimal digits and operate with a lightening speed.

Before feeding information into the computer special machines, which look and operate like ordinary type-writers, can change or translate the entire contents of a problem into a binary notation onto cards or tape.

The answer from the computers output is also received on cards or tape and fed through another translator that will deliver the desired information to the programmer in decimal numbers and English letters.

Текст 10. Planet of the Apes? Not Likely — and Here's Why

By Jeffrey Kluger, BBC News

It's always been easy to understand why human beings developed technology, poetry, music, agriculture, language, cities and medicine, and other critters didn't: big brains — full stop. The animal with the best cognitive computer is simply going to do better than all the others, and that advantage tends to build on itself, with the brain upgrading itself with each iteration of the species.

But intelligence is only part of our collective success. You may be the smartest member of your early-human tribe, but if you die without ever telling other early humans all the cool and innovative things you know, those accomplishments die with you. The real key to the steady climb of humanity — what anthropologists call the "racheting" of the culture — is

sharing, the democratic distribution of information so that what starts off as personal knowledge eventually becomes community knowledge. Once an idea goes viral that way, everyone can take a crack at improving on it further.

Sharing, unlike many of our other gifts, is not exclusive to us. Individuals in many species learn from each other by observation and even instruction. Still, the kinds of skills each species needs to acquire are very different; it's the rare human mother who has to teach her kids how to crack open a mollusk with a rock, but for an otter mama it's job one. That makes it hard to compare how well humans share knowledge with how well other critters do it.

In a study just published in the journal Science, however, a team of biologists from the U.K., the U.S. and France, came up with a way, subjecting teams of chimpanzees, capuchin monkeys and three- to four-year old children to a puzzle-solving task that all of them could theoretically solve. The goal was not to see which species did best at figuring out the problem (spoiler alert: the kids won), but how well they cooperated within their own groups to get the job done.

The investigators assembled groups of 34 kids, 74 chimps and 40 capuchins (no,not in the same room), broke them into smaller teams and had each work on a closed box that contained three, increasingly valuable rewards. A door had to be pushed the proper way to reveal the first reward. That also unlocked two buttons which could be pressed to reveal the second reward, and that in turn activated a knob that could be turned to release the third. For the animals, the rewards were carrots (which they like), apple slices (which they love) and grapes (which they die for). For the kids, the prizes were stickers of increasing size and attractiveness. There are three main ways to share information in a task like this one: verbal instruction, imitation and sharing your early rewards — which motivates other individuals to help get later ones. The chimps and capuchins could not exactly ace the verbal part, but there'd be nothing to stop them from doubling down in the other two areas — provided they wanted to.

Текст 11. The Mystery of the Galactic Train Wreck

Physicists love to smash things together — not just because there's a certain guilty pleasure involved, but also because you can learn a lot about nature that way. Men and women who study elementary particles conduct their demolition derbies with atom smashers; that's how they discovered

quarks and muons and maybe even the long elusive Higgs boson.

For astrophysicists, things are a little tougher. Collisions between planets, stars and other heavenly objects can be just as enlightening as particle crack-ups, but you can't simply make them happen. Sometimes the stargazers get lucky, however, like when a comet broke apart and peppered Jupiter with interplanetary shrapnel back in 1994, yielding valuable information about the atmosphere of the solar system's biggest planet.

And sometimes these random cosmic collisions take place on a truly gigantic scale.

That's the case with Abell 520, a cluster of thousands of individual galaxies about 2.4 billion light-years from Earth. The structure of Abell 520 is so jumbled and chaotic it's informally known as the Train Wreck Cluster — and in fact, it was created by a humongous, slow-motion pileup of three or four galaxy clusters that were already huge in their own right.

Rather than solve a mystery, though, new observations of Abell 520 may actually have pushed astronomers further from answering one of cosmology's longest-standing mysteries: What is the true nature of dark matter? Observers know that dark matter is out there because they can see its gravity pulling on the visible stars and galaxies. They know it's truly massive, weighing in at five or six times the mass of all those stars and galaxies combined. But since they can't actually see the stuff directly, scientists have concluded it's probably made of enormous clouds of some still undiscovered subatomic particle (and if they're right, dark-matter particles are passing harmlessly through your body by the billions every minute).

This idea got a big boost back in 2006 when astronomers used a suite of telescopes to observe an object known as the Bullet Cluster, a pair of galactic clusters that had recently passed right through each other (recently meaning in the past billion years). Clouds of normal gas within the two formations slammed into each other, slowed down and heated up. The galaxies themselves, whose billions of solid bodies are spaced too far apart to hit each other directly, just kept going. If dark matter truly has the properties physicists believe it does, the clouds of the invisible material pervading each cluster should have just kept going too. That's exactly what happened: even though astronomers can't observe dark matter directly, they can see that more distant, background galaxies look distorted, thanks to the dark-matter clouds' intense gravity.

Текст 12. Do animals have imagination?

Decades of intensive studies have revealed that chimpanzees and other species can pretend. But they might not be able to fully tell reality from fantasy.

The human tendency to share may have more ancient evolutionary routes than previously thought.

An eight-year-old juvenile chimpanzee named Kakama trudged along a path among the forest trees, following his pregnant mother. A scientist sat silently at a distance, watching Kakama pick up a log and carry it with him for hours. At one point, Kakama made a nest and placed the log in it, as if it were a small chimpanzee. Months later, two field assistants observed the same thing: Kakama was playing with a similar log, which they labelled "Kakama's toy baby."

Was Kakama simply confused? Did he really think that the log was a smaller version of himself? Or did Kakama know that the log was really a log, and was only pretending that the log was a baby?

Kanzi, the famous bonobo, liked to pretend as well. Primatologist Sue SavageRumbaugh described watching Kanzi hide invisible objects under blankets or leaves, later removing them from their hiding spots, and pretending to eat them. "Kanzi also engages the participation of others" in these games, Savage-Rumbaugh notes, "by giving them the pretend object and watching to see what they do with it."

From an early age, human children act out imagined scenes that conflict with reality. Psychologist Robert W Mitchell calls children "prototypical pretenders", and he writes that pretend play, or make-believe, is "a mental activity involving imagination". Which is, admittedly, useless as a definition.

Dreams could be thought of as being one form of imagination. When researchers measured the brain activity of rats as they were learning to navigate a maze, they saw the same firing pattern while they were asleep as when they were awake. The rats were running through the mazes in their sleep – it was as if someone had pressed the rewind button on a brain activity recorder, and pressed play.

But pretending or "make believe" requires a bit more mental complexity than that. One kind of pretence involves imagining that one object, such as a banana, is actually a second type of object, such as a telephone, or imagining that a lifeless object such as a doll is actually animate – both of which were observed with Kakama.

Another type of pretence involves imagining an object that isn't even there in the first place, such as when children (or adults) play air guitar. An illuminating example of this sort of imagination comes from a chimpanzee named Viki who was raised in a human home. Viki had lots of toys, including some attached to strings that could be pulled along. Primatologists Mary Lee Jensvold and Roger Fouts recount the original description of Viki's behaviour: "Very slowly and deliberately she was marching around the toilet, trailing the fingertips of one hand on the floor. Now and then she paused, glanced back at her hand, and then resumed her progress… She trudged along just this busily on two feet and one hand, while the other arm extended backward this way to pull the toy. Viki had an imaginary pulltoy!" And not only that. Viki sometimes acted as if her pulltoy had got stuck on something. She tugged on the invisible string until she imagined that the toy had gotten free. Once, when her invisible toy was "stuck", she waited until her human caregiver pretended to free the toy, before continuing to play with it.

Some of the more charming examples of animal imagination come from the female gorilla Koko, who was trained to use American Sign Language. Koko routinely pretended that her dolls were her companions, frequently tried to nurse them, and often signed to them, sometimes giving them instructions. In one instance, a fiveyear-old Koko orchestrated an exchange between two toy gorillas, one blue and one pink. First, looking at the pink gorilla, she signed BAD BAD and then KISS towards the blue one. She then instructed the pair of toys to CHASE and TICKLE before smacking the two dolls together. After wrestling with each doll, Koko stopped and signed, GOOD GORILLA. GOOD GOOD.

Текст 13. Coping With Laughter

In addition to suggesting a cause of humor, the benign-violation theory also goes a long way toward explaining one of its common *effects*—namely, that jokes help people cope with the hard times in life. An ability to laugh at rough moments can reduce the negative emotions surrounding a stressful event and also create the positive feelings associated with amusement in general. Put together, those two affective swings can enhance a person’s coping powers.

“To the extent you can use humor to change your perspective on things, to see something that is potentially threatening as less threatening, then that allows you to be more efficient in your coping,” says Arnie Cann

of the University of North Carolina at Charlotte. “From a very psychological level, just being able to use humor to change the way you interpret a situation — so it doesn’t seem quite as threatening — seems very important.” The idea that humor has healing powers goes back to the Bible — “a merry heart doeth good like a medicine,” Proverbs 17:22 — but its direct effect on stress wasn’t investigated in the lab until the early 1980s. Canadian researchers Rod Martin and APS Fellow Herbert Lefcourt, writing in the *Journal of Personality and Social Psychology* in 1983, reported initial evidence that “humor permits one to cope better with the aversive experiences of life.” Since then empirical studies have shown, time and again, that humor can ease our stressful times.

Cann entered the field after he was asked to do some training with emergency medical workers whose jobs routinely exposed them to stressful, somewhat tragic situations. He and a colleague discovered that the workers frequently dealt with the emotional strain of their work by resorting to humor. (They were always careful never to do so in front of patients, Cann points out; again, psychological distance is relative.)

“Sometimes you might make a joke that helps everyone get over the fact that they’ve just dealt with a very difficult situation,” says Cann. “Humor was, in their view, essential to their survival and their occupation.” In one of Cann’s early studies, published in the journal *Humor* in 2000, he and some colleagues showed test participants two videotapes. One was a compilation of graphic fatality scenes called “Faces of Death”; the other was a stand-up comedy routine. (A control group watched a neutral video instead of the comedy.) Afterward, the test participants reported their impressions of the videos and assessed their moods and emotions.

The results suggested that the coping effects of humor are remarkably flexible. When test participants saw the funny video before the disturbing one, the comedy not only elevated their positive mood, it also seemed to inoculate them to the stressors of the violent scenes. When participants watched the stand-up sketch *after* the graphic video, their good mood still rose, though some of the anxiety remained. Cann and colleagues concluded that humor can either prevent stress *or* cure it —though it’s a bit more effective in the preventive role.

“Even things that are not hilarious, that are simply amusing, that might just lead you to smile —the very act of smiling puts people in a more positive frame of mind,” says Cann. “That’s a benefit.”

Now, there’s certainly a limit to the popular belief that “laughter is the best medicine.” In a 2002 paper in *Current Directions in Psychological*

Science, Rod Martin reviewed the evidence linking humor to physical effects like pain tolerance, blood pressure reduction, longevity, and illness — and found it tenuous at best. Overall, Martin reported in his literature review that the physical health benefits of humor and laughter were "less conclusive than commonly believed."

Still, the *psychological* coping mechanism that helps humor relieve anxiety and stress continues to show up strong in empirical studies. "Having a good laugh is sort of inconsistent or incompatible with anxiety and fear," says Thomas Ford of Western Carolina University, whose work centers on the relationship between humor and coping. "I think if people are able to find humor in their personal difficulties, they certainly are better off."

In one recent study, published in a 2012 issue of *Humor*, Ford and colleagues found a novel way to measure how effective humor is at inhibiting personal anxiety. The researchers gathered test participants into a lab and stressed them out by telling them they'd be taking a difficult math exam as part of the experiment. Then some participants read 10 comics from the "Close to Home" newspaper series by John McPherson, while others read 10 poems (or nothing at all).

The participants exposed to humor not only reported less anxiety about the test — they scored significantly better than the others. There's a long way from the stress of a math test to the stress of something like the Holocaust, of course, but the basic protective value of humor remains quite clear.

"So I think, to extrapolate from that study, that we cope with tragedy —stress on a much larger scale —through humor just as a way to reduce the negative anxiety-related emotions associated with it," says Ford. "Over time we can make light of almost anything."

Текст 14. Cold War Nuclear Bomb Tests Are Helping Researchers Identify Art Forgeries

A new method of detecting forgeries uses minuscule canvas fibers and paint samples to expose purportedly historic works of art as modern creations.

The technique, catalogued in the *Proceedings of the National Academy of Sciences*, dates would-be masterpieces by measuring traces of carbon-14 isotopes released into the atmosphere by mid-20th century nuclear bomb testing. Objects made after 1963 hold significantly higher levels of

the unstable isotope, allowing researchers to differentiate between pre- and post-World War II paintings.

This isn't the first time scientists have turned to radiocarbon dating in an attempt to thwart forgers. As Niraj Chokshi explains for The New York Times, the idea of dating art by assessing the organic matter used to bind paint pigments was first floated as early as 1972; previous case studies include a 2015 investigation that debunked the provenance of a supposed Fernand Léger canvas owned by American art collector Peggy Guggenheim.

Still, the approach has its drawbacks. According to *artnet News*' Taylor Dafoe, savvy forgers recycle antique canvases and even paint, making it difficult to determine if a painting is original or simply artfully doctored. At the same time, the *Economist* notes, radiocarbon testing is so destructive that a sample can rarely be analyzed twice. Typically, the process also requires a "sufficient[ly]" sized sample: Given the possibility that a suspected forgery may actually be a bonafide masterpiece, investigators are often reluctant to remove significant amounts of paint. Fragments of a wooden frame or pieces trimmed from the edge of a canvas, on the other hand, "might be [considered] an acceptable loss."

The new research, led by Laura Hendriks of Switzerland's ETH Zurich, draws on the latest technological advances to reduce the size of samples needed for testing. Working with a known forgery dating to the 1980s, the team extracted hairlike strands of canvas fiber measuring just a few millimeters long and a paint particle weighing less than 200 micrograms.

Although the painting—titled *Village Scene with Horse and Honn & Company Factory*—mimics the American primitive folk art style and is signed "Sarah Honn May 5, 1866 A.D," it's actually the work of convicted forger Robert Trotter. As Treasures on Trial, an online portal run by Delaware's Winterthur Museum, Garden & Library, notes, Trotter stripped, repainted and artificially aged worthless old paintings, as well as created lengthy provenance reports that seemingly testified to the works' authenticity. Ultimately, he admitted to selling 52 falsified paintings and served 10 months in prison. Following Trotter's conviction, Buffalo State College's Art Conservation Department acquired the "Sarah Honn" canvas, which has been studied to better understand forgery methods.

According to *Chemistry World*'s Emma Stoye, Hendriks and her colleagues relied on "standard non-destructive techniques" to identify a suitable paint particle within an existing crack on the painting. Once the researchers had extracted the paint and canvas fiber samples, they used an

elemental analyzer to burn the materials into carbon dioxide. This gas was then fed into an accelerated mass spectrometer capable of measuring the ratio of carbon-14 to carbon-12 isotopes present.

Based on carbon isotope ratios, the team found that the canvas could have been crafted at any point between the late 1600s and mid-1900s, suggesting it was likely a recycled, age-appropriate specimen. The binder found in the paint, however, had enough carbon-14 to definitively date it to the post-war period. Additionally, Chokshi writes for *The New York Times*, the oil used to bind the paint was shown to be derived from seeds harvested between 1958 and 1961 or 1983 and 1989.

Speaking with Stoye, Jilleen Nadolny, a principal investigator at Art Analysis & Research who was not involved in the study, says there are still limitations to the revamped technique. "You have to be very aware when sampling to avoid contamination," she explains, "and there are huge chunks of time where you don't get anything specific."

Greg Hodgins, a physicist who leads a radiocarbon dating lab at the University of Arizona and was also not involved in the new research, echoes this sentiment, telling Chokshi that while the method is "an important advance, … it's not a silver bullet."

Crucially, Chokshi notes, carbon-14 isotopes, spurred by ocean absorption and dilution by fossil fuel emissions, are on track to return to pre-war levels. This could lead to inconclusive results further down the road, making it essential to use radiocarbon dating in conjunction with other techniques.

"It can still be useful but it's going to be more and more difficult," Hendriks concludes to Chokshi. "It's kind of like a puzzle coming together."

Текст 15. DARK MATTER

In the grand tally of cosmic constituents, galaxies are what typically get counted. Latest estimates show that the observable universe may contain a hundred billion of them. Bright and beautiful and packed with stars, galaxies decorate the dark voids of space like cities across a country at night. But just how voidy is the void of space? (How empty is the countryside between cities?) Just because galaxies are in your face, and just because they would have us believe that nothing else matters, the universe may nonetheless contain hard-to-detect things between the galaxies. Maybe those things are more interesting, or more important to the evolution of the universe, than the galaxies themselves.

Our own spiral-shaped galaxy, the Milky Way, is named for its spilled-milk appearance to the unaided eye across Earth's nighttime sky. Indeed, the very word "galaxy" derives from the Greek galaxias, "milky." Our pair of nearest-neighbor galaxies, 600,000 light-years distant, are both small and irregularly shaped. Ferdinand Magellan's ship's log identified these cosmic objects during his famous round-the-world voyage of 1519. In his honor, we call them the Large and Small Magellanic Clouds, and they are visible primarily from the Southern Hemisphere as a pair of cloud-like splotches on the sky, parked beyond the stars. The nearest galaxy larger than our own is two million light-years away, beyond the stars that trace the constellation Andromeda. This spiral galaxy, historically dubbed the Great Nebula in Andromeda, is a somewhat more massive and luminous twin of the Milky Way. Notice that the name for each system lacks reference to the existence of stars: Milky Way, Magellanic Clouds, Andromeda Nebula. All three were named before telescopes were invented, so they could not yet be resolved into their stellar constituencies.

As detailed in chapter 9, without the benefit of telescopes operating in multiple bands of light we might still declare the space between the galaxies to be empty. Aided by modern detectors, and modern theories, we have probed our cosmic countryside and revealed all manner of hard-to-detect things: dwarf galaxies, runaway stars, runaway stars that explode, million-degree X-ray-emitting gas, dark matter, faint blue galaxies, ubiquitous gas clouds, super-duperhigh-energy charged particles, and the mysterious quantum vacuum energy. With a list like that, one could argue that all the fun in the universe happens between the galaxies rather than within them.

In any reliably surveyed volume of space, dwarf galaxies outnumber large galaxies by more than ten to one. The first essay I ever wrote on the universe, in the early 1980s, was titled "The Galaxy and the Seven Dwarfs," referring to the Milky Way's diminutive nearby family. Since then, the tally of local dwarf galaxies has been counted in the dozens. While full-blooded galaxies contain hundreds of billions of stars, dwarf galaxies can have as few as a million, which renders them a hundred thousand times harder to detect. No wonder they are still being discovered in front of our noses.

Images of dwarf galaxies that no longer manufacture stars tend to look like tiny, boring smudges. Those dwarfs that do form stars are all irregularly shaped and, quite frankly, are a sorry-looking lot. Dwarf galaxies have three things working against their detection: They are small, and so

are easily passed over when seductive spiral galaxies vie for your attention. They are dim, and so are missed in many surveys of galaxies that cut off below a prespecified brightness level. And they have a low density of stars within them, so they offer poor contrast above the glow of surrounding light from Earth's nighttime atmosphere and from other sources. All this is true. But since dwarfs far outnumber "normal" galaxies, perhaps our definition of what is normal needs revision.

You will find most (known) dwarf galaxies hanging out near bigger galaxies, in orbit around them like satellites. The two Magellanic Clouds are part of the Milky Way's dwarf family. But the lives of satellite galaxies can be quite hazardous. Most computer models of their orbits show a slow decay that ultimately results in the hapless dwarfs getting ripped apart, and then eaten, by the main galaxy. The Milky Way engaged in at least one act of cannibalism in the last billion years, when it consumed a dwarf galaxy whose flayed remains can be seen as a stream of stars orbiting the galactic center, beyond the stars of the constellation Sagittarius. The system is called the Sagittarius Dwarf, but should probably have been named Lunch.

In the high-density environment of clusters, two or more large galaxies routinely collide and leave behind a titanic mess: spiral structures warped beyond all recognition, newly induced bursts of star-forming regions spawned from the violent collision of gas clouds, and hundreds of millions of stars strewn hither and yon having freshly escaped the gravity of both galaxies. Some stars reassemble to form blobs that could be called dwarf galaxies. Other stars remain adrift. About ten percent of all large galaxies show evidence of a major gravitational encounter with another large galaxy—and that rate may be five times higher among galaxies in clusters.

With all this mayhem, how much galactic flotsam permeates intergalactic space, especially within clusters? Nobody knows for sure. The measurement is difficult because isolated stars are too dim to detect individually. We must rely on detecting a faint glow produced by the light of all stars combined. In fact, observations of clusters detect just such a glow between the galaxies, suggesting that there may be as many vagabond, homeless stars as there are stars within the galaxies themselves.

Adding ammo to the discussion, we have found (without looking for them) more than a dozen supernovas that exploded far away from what we presume to be their "host" galaxies. In ordinary galaxies, for every star that explodes in this way, a hundred thousand to a million do not, so isolated supernovas may betray entire populations of undetected stars. Supernovas are stars that have blown themselves to smithereens and, in the process,

have temporarily (over several weeks) increased their luminosity a billion-fold, making them visible across the universe. While a dozen homeless supernovas is a relatively small number, many more may await discovery, since most supernova searches systematically monitor known galaxies and not empty space.

There's more to clusters than their constituent galaxies and their wayward stars. Measurements made with X-ray-sensitive telescopes reveal a space-filling, intra-cluster gas at tens of millions of degrees. The gas is so hot that it glows strongly in the X-ray part of the spectrum. The very movement of gas-rich galaxies through this medium eventually strips them of their own gas, forcing them to forfeit their capacity to make new stars. That could explain it. But when you calculate the total mass present in this heated gas, for most clusters it exceeds the mass of all galaxies in the cluster by as much as a factor of ten. Worse yet, clusters are overrun by dark matter, which happens to contain up to another factor of ten times the mass of everything else. In other words, if telescopes observed mass rather than light, then our cherished galaxies in clusters would appear as insignificant blips amid a giant spherical blob of gravitational forces

In the rest of space, outside of clusters, there is a population of galaxies that thrived long ago. As already noted, looking out into the cosmos is analogous to a geologist looking across sedimentary strata, where the history of rock formation is laid out in full view. Cosmic distances are so vast that the travel time for light to reach us can be millions or even billions of years. When the universe was one half its current age, a very blue and very faint species of intermediate-sized galaxy thrived. We see them. They hail from a long time ago, representing galaxies far, faraway. Their blue comes from the glow of freshly formed, short-lived, high-mass, high-temperature, high-luminosity stars. The galaxies are faint not only because they are distant but because the population of luminous stars within them was thin. Like the dinosaurs that came and went, leaving birds as their only modern descendant, the faint blue galaxies no longer exist, but presumably have a counterpart in today's universe. Did all their stars burn out? Have they become invisible corpses strewn throughout the universe? Did they evolve into the familiar dwarf galaxies of today? Or were they all eaten by larger galaxies? We do not know, but their place in the timeline of cosmic history is certain.

Текст 16. QUESTIONING THE RELIGION

A week before the events of September 11, 2001,1 was on a panel with Dennis Prager, who is one of America's betterknown religious broadcasters. He challenged me in public to answer what he called a "straight yes/no question," and I happily agreed. Very well, he said. I was to imagine myself in a strange city as the evening was coming on. Toward me I was to imagine that I saw a large group of men approaching. Now—would I feel safer, or less safe, if I was to learn that they were just coming from a prayer meeting? As the reader will see, this is not a question to which a yes/no answer can be given. But I was able to answer it as if it were not hypothetical. "Just to stay within the letter 'B,' I have actually had that experience in Belfast, Beirut, Bombay, Belgrade, Bethlehem, and Baghdad. In each case I can say absolutely, and can give my reasons, why I would feel immediately threatened if I thought that the group of men approaching me in the dusk were coming from a religious observance."

Here, then, is a very brief summary of the religiously inspired cruelty I witnessed in these six places. In Belfast, I have seen whole streets burned out by sectarian warfare between different sects of Christianity, and interviewed people whose relatives and friends have been kidnapped and killed or tortured by rival religious death squads, often for no other reason than membership of another confession. There is an old Belfast joke about the man stopped at a roadblock and asked his religion. When he replies that he is an atheist he is asked, "Protestant or Catholic atheist?" I think this shows how the obsession has rotted even the legendary local sense of humor. In any case, this did actually happen to a friend of mine and the experience was decidedly not an amusing one. The ostensible pretext for this mayhem is rival nationalisms, but the street language used by opposing rival tribes consists of terms insulting to the other confession ("Prods" and "Teagues"). For many years, the Protestant establishment wanted Catholics to be both segregated and suppressed. Indeed, in the days when the Ulster state was founded, its slogan was: "A Protestant Parliament for a Protestant People." Sectarianism is conveniently self-generating and can always be counted upon to evoke a reciprocal sectarianism. On the main point, the Catholic leadership was in agreement. It desired clerical dominated schools and segregated neighborhoods, the better to exert its control. So, in the name of god, the old hatreds were drilled into new generations of schoolchildren, and are still being drilled. (Even the word "drill" makes me queasy: a pow-

er tool of that kind was often used to destroy the kneecaps of those who fell foul of the religious gangs.)

When I first saw Beirut, in the summer of 1975, it was still recognizable as "the Paris of the Orient." Yet this apparent Eden was infested with a wide selection of serpents. It suffered from a positive surplus of religions, all of them "accommodated" by a sectarian state constitution. The president by law had to be a Christian, usually a Maronite Catholic, the speaker of the parliament a Muslim, and so on. This never worked well, because it institutionalized differences of belief as well as of caste and ethnicity (the Shia Muslims were at the bottom of the social scale, the Kurds were disenfranchised altogether). The main Christian party was actually a Catholic militia called the Phalange, or "Phalanx," and had been founded by a Maronite Lebanese named Pierre Gemayel who had been very impressed by his visit to Hitler's Berlin Olympics in 1936. It was later to achieve international notoriety by conducting the massacre of Palestinians at the Sabra and Chatila refugee camps in 1982, while acting under the orders of General Sharon. That a Jewish general should collaborate with a fascist party may seem grotesque enough, but they had a common Muslim enemy and that was enough. Israel's irruption into Lebanon that year also gave an impetus to the birth of Hezbollah, the modestly named "Party of God," which mobilized the Shia underclass and gradually placed it under the leadership of the theocratic dictatorship in Iran that had come to power three years previously. It was in lovely Lebanon, too, having learned to share the kidnapping business with the ranks of organized crime, that the faithful moved on to introduce us to the beauties of suicide bombing. I can still see that severed head in the road outside the near-shattered French embassy. On the whole, I tended to cross the street when the prayer meetings broke up. Bombay also used to be considered a pearl of the Orient, with its necklace of lights along the corniche and its magnificent British Raj architecture. It was one of India's most diverse and plural cities, and its many layers of texture have been cleverly explored by Salman Rushdie— especially in The Moor's Last Sigh—and in the films of Mira Nair. It is true that there had been intercommunal fighting there, during the time in 1947-48 when the grand historic movement for Indian self-government was being ruined by Muslim demands for a separate state and by the fact that the Congress Party was led by a pious Hindu. But probably as many people took refuge in Bombay during that moment of religious bloodlust as were driven or fled from it.

A form of cultural coexistence resumed, as often happens when cities are exposed to the sea and to influences from outside. Parsis—former Zo-

roastrians who had been persecuted in Persia—were a prominent minority, and the city was also host to a historically significant community of Jews. But this was not enough to content Mr. Bal Thackeray and his Shiv Sena Hindu nationalist movement, who in the 1990s decided that Bombay should be run by and for his coreligionists, and who loosed a tide of goons and thugs onto the streets. Just to show he could do it, he ordered the city renamed as "Mumbai," which is partly why I include it in this list under its traditional title.

Belgrade had until the 1980s been the capital of Yugoslavia, or the land of the southern Slavs, which meant by definition that it was the capital of a multiethnic and multiconfessional state. But a secular Croatian intellectual once gave me a warning that, as in Belfast, took the form of a sour joke. "If I tell people that I am an atheist and a Croat," he said, "people ask me how I can prove I am not a Serb." To be Croatian, in other words, is to be Roman Catholic. To be a Serb is to be Christian Orthodox. In the 1940s, this meant a Nazi puppet state, set up in Croatia and enjoying the patronage of the Vatican, which naturally sought to exterminate all the Jews in the region but also undertook a campaign of forcible conversion directed at the other Christian community. Tens of thousands of Orthodox Christians were either slaughtered or deported in consequence, and a vast concentration camp was set up near the town of Jasenovacs. So disgusting was the regime of General Ante Pavelic and his Ustashe party that even many German officers protested at having to be associated with it. By the time I visited the site of the Jasenovacs camp in 1992, the jackboot was somewhat on the other foot. The Croatian cities of Vukovar and Dubrovnik had been brutally shelled by the armed forces of Serbia, now under the control of Slobodan Milosevic. The mainly Muslim city of Sarajevo had been encircled and was being bombarded around the clock. Elsewhere in Bosnia-Herzegovina, especially along the river Drina, whole towns were pillaged and massacred in what the Serbs themselves termed "ethnic cleansing." In point of fact, "religious cleansing" would have been nearer the mark. Milosevic was an exCommunist bureaucrat who had mutated into a xenophobic nationalist, and his anti-Muslim crusade, which was a cover for the annexation of Bosnia to a "Greater Serbia," was to a large extent carried out by unofficial militias operating under his "deniable" control. These gangs were made up of religious bigots, often blessed by Orthodox priests and bishops, and sometimes augmented y fellow Orthodox "volunteers" from Greece and Russia. They made a special attempt to destroy all evidence of Ottoman civilization, as in the specially atrocious case of the dynamiting of

several historic minarets in Banja Luka, which was done during a cease-fire and not as the result of any battle.

The same was true, as is often forgotten, of their Catholic counterparts. The Ustashe formations were revived in Croatia and made a vicious attempt to take over Herzegovina, as they had during the Second World War. The beautiful city of Mostar was also shelled and besieged, and the world-famous Stari Most, or "Old Bridge," dating from Turkish times and listed by UNESCO as a cultural site of world importance, was bombarded until it fell into the river below. In effect, the extremist Catholic and Orthodox forces were colluding in a bloody partition and cleansing of Bosnia-Herzegovina. They were, and still are, largely spared the public shame of this, because the world's media preferred the simplification of "Croat" and "Serb," and only mentioned religion when discussing "the Muslims." But the triad of terms "Croat," "Serb," and "Muslim" is unequal and misleading, in that it equates two nationalities and one religion. (The same blunder is made in a different way in coverage of Iraq, with the "SunniShia- Kurd" trilateral.) There were at least ten thousand Serbs in Sarajevo throughout the siege, and one of the leading commanders of its defense, an officer and gentleman named General Jovan Divjak, whose hand I was proud to shake under fire, was a Serb also. The city's Jewish population, which dated from 1492, also identified itself for the most part with the government and the cause of Bosnia. It would have been far more accurate if the press and television had reported that "today the Orthodox Christian forces resumed their bombardment of Sarajevo," or "yesterday the Catholic militia succeeded in collapsing the Stari Most." But confessional terminology was reserved only for "Muslims," even as their murderers went to all the trouble of distinguishing themselves by wearing large Orthodox crosses over their bandoliers, or by taping portraits of the Virgin Mary to their rifle butts. Thus, once again, religion poisons everything, including our own faculties of discernment.

As for Bethlehem, I suppose I would be willing to concede to Mr. Prager that on a good day, I would feel safe enough standing around outside the Church of the Nativity as evening came on. It is in Bethlehem, not far from Jerusalem, that many believe that, with the cooperation of an immaculately conceived virgin, god was delivered of a son.

СОДЕРЖАНИЕ

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