

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РОССИЙСКОЙ ФЕДЕРАЦИИ

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ТЕОРИЯ ПЕРЕВОДА

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по направлениям 08.03.01 «Строительство»,
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Учебное пособие составлено на кафедре иностранных языков и предназначено для студентов, обучающихся по направлениям 08.03.01 «Строительство», 07.03.01 «Архитектура», 07.03.04 «Градостроительство».

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ПРЕДИСЛОВИЕ

Данное учебное пособие содержит курс лекций по переводу научно-технической литературы. Представлены вопросы о проблемах перевода, включая машинный перевод. Имеется информация о способах перевода ораторской речи и заголовков, а также о переводе неологизмов. Теоретический материал иллюстрируется примерами на английском и русском языках. Кроме того, в материале пособия представлены тексты на английском языке, взятые из английских и американских источников. К ним имеются задания для анализа и перевода. Пособие предназначено для студентов, изучающих курс основ теории перевода и обучающихся по направлениям «Строительство», «Архитектура», «Градостроительство».

Часть I. КУРС ЛЕКЦИЙ

МАШИННЫЙ ПЕРЕВОД И ПЕРСПЕКТИВЫ ЕГО ИСПОЛЬЗОВАНИЯ В УЧЕБНО-ПРАКТИЧЕСКОЙ ДЕЯТЕЛЬНОСТИ

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Введение

Некоторые люди считают, что машинные переводы (МП) далеки от тех, которые выполняются человеком, а потому абсолютно бесполезны. Действительно, в литературе описано достаточно много примеров «глупости» машинных переводов, которые трактуют фразы типа «bring her back to me» как «принеси мне ее спину». И популярность подобных примеров можно понять. Вспомним, как много появилось областей деятельности, где компьютер обогнал человека – считает быстрее, в шахматы играет лучше.

Но эти люди скорее всего забывают, что машинные переводы существуют для того, чтобы помогать человеку, а вовсе не затем, чтобы тешить самолюбие переводчиков, которые бы говорили: «мы-то пока переводим лучше, чем компьютеры». Говоря о сложности перевода художественного произведения, можно напомнить, что и среди людей далеко не каждый может переводить, как Маршак или Пастернак.

Необходимо признать (да этого не отрицают и ведущие разработчики систем машинного перевода), что сегодня, как, впрочем и в обозримом будущем, художественный текст всегда выигрывает в переводе, выполненном человеком. С другой стороны, это отнюдь не отрицает полезности систем машинного перевода, уже давно являющихся незаменимым подспорьем не только для тех, кто совсем не знает языка, но и для профессионалов.

Во-первых, перед переводом стоят далеко не одни высокохудожественные задачи. Машинный перевод многих деловых документов приближается к переводам, сделанным человеком.

Во-вторых, никакой переводчик (даже самый знающий) не напечатает перевод с такой скоростью, как переводчик машинный.

В-третьих, программа-переводчик всегда под рукой, ей можно доверить любую конфиденциальную информацию, и, наконец, очевидно, что машинный перевод существенно дешевле по сравнению с тем, что выполнен в бюро переводов.

Машинные переводчики в значительной мере облегчают беглый просмотр сайтов Интернета на неизвестных нам языках. При этом, по-видимому, задача выбора информации из Интернета не может быть решена никакими другими способами. Кроме того, для каждой системы существует своя область применения, и машинные переводчики не претендуют на перевод художественной литературы.

Проблема машинного перевода – одна из центральных в области теоретической информатики и информационных технологий. На сегодняшний день здесь существует ряд глубоких теоретических разработок и ряд работающих компьютерных систем. Прогресс в этом направлении за последние 10–20 лет достаточно очевиден, однако мы еще очень далеки от удовлетворительного решения задачи.

Лекция 1. Формирование школы машинного перевода

«Идея автоматического перевода (АП) высказывалась, как известно, еще Лейбницем более 300 лет тому назад. Однако на реальную научную и техническую основу эта задача была поставлена только в нашем веке.

Всю первую половину XX века идея перевода с помощью искусственных механизмов «носила в воздухе». В 1924 г. в эстонской газете *Vaba maa* было опубликовано сообщение о демонстрации модели пишущей машины-переводчика изобретателем А. Вахером. В 1933 г. развернутый проект «переводческой машины» предложил российский изобретатель П.П. Петров-Троянский – наиболее известный из предшественников современного АП. В том же 1933 г. во Франции инженер Георгий Арцруни получил патент на машину для перевода, которую он назвал «Механическим мозгом» [23, с.105].

Известно, что перевод как особый процесс межъязыковых преобразований затрагивает в комплексе разные уровни языка – морфологию, лексику, синтаксис, семантику. Модель перевода, таким образом, должна отражать иерархию языковых уровней, причем некоторым оптимальным для перевода образом. Большое значение принимает пригодность работы системы в режиме общения с человеком.

Развитие машинного перевода и его современную картину можно представить себе как взаимодействие, борьбу двух направлений, двух главных подходов к проблеме. Первый подход характеризуется установкой на

использование максимально мощного универсального языка смысла. В первых системах реализовался так называемый «прямой» подход к переводу, в рамках которого, как уже отмечалось, все осуществляемые при переводе операции трактовались как операции межъязыкового перехода – преобразования текста оригинала в текст перевода.

В машинном переводе в соответственном смысле этот подход приводит к так называемым «тотальным стратегиям» [12, с. 27]. Общей характеристикой тотальных стратегий является стремление получить полностью автоматизированный высококачественный машинный перевод с максимальным использованием семантического уровня языка. Этот подход внес значительный вклад, как в теорию, так и в практику машинного перевода.

Второй подход хронологически возник раньше первого. Этот подход заключается в представлении о промежуточном языке и близко связан с идеей переводных соответствий на чисто языковом уровне. Методическая суть данного подхода заключается: в изучении поведения языковых единиц, особенно в языковом контексте; в моделировании человеческого владения языком, особенно в процессе межъязыкового перевода; в переходе от простого к более сложному. По-настоящему серьезная работа в области машинного перевода началась только в конце 40-х начале 50-х годов, после появления электронно-вычислительной техники.

Исследователи полагают, что датой рождения МП (как области исследований) принято считать 1947 г. Одним из первых о машинном переводе заговорил Уоррен Вивер, директор отделения естественных наук Рокфеллеровского фонда, который, обращаясь в письме к Норберту Винеру, сравнивал задачу перевода с задачей дешифровки текстов: «Глядя на статью на русском языке, я говорю себе: в действительности статья написана по-английски, но зашифрована какими-то непонятными знаками», и после этого начинаю ее расшифровывать». В 1949 году он опубликовал документ, который имел весьма громкое название: «Решение мировой проблемы перевода». В 1952 году состоялась первая конференция, на которой обсуждались подходы к созданию систем машинного перевода, а уже в 1954 году компания IBM разработала первую систему, содержащую словарь из 250 слов и 6 синтаксических правил и обеспечивавшую перевод заранее отобранных предложений. Этот эксперимент дал старт интенсивным десятилетним исследованиям, на которые правительство США истратило почти 40 млн долларов.

Принципы МП, господствовавшие в тот период, с современных позиций могли бы быть охарактеризованы как обработка текста под управлением словаря, которая осуществляется с помощью однозначных процедур, целиком подчинена задаче перехода от входного языка к выходному (т.е. не предусматривает никаких этапов, чьи функции были бы

самостоятельными и могли бы определяться не в связи с этим межъязыковым переходом). Задача МП ставилась тогда как чисто практическая. [14, с.28] Предложения на английском языке преобразуются в соответствующее предложение на другом языке с помощью двух основных операций. Первая операция – отдельные слова заменяются своими переводами, вторая – переведенные слова переставляются и видоизменяются по правилам языка перевода.

Авторы ранних исследований по машинному переводу сосредоточивались на технических проблемах размещения в памяти компьютера большого словаря и обеспечении эффективного поиска в нем. Многие исследователи, например, такие как Ю.Н. Марчук, Л.Л. Нелюбин, И.И. Ревзин считают, что программное обеспечение для работы с грамматикой основывалось на имевшихся теориях структуры языка в сочетании с придуманными на скорую руку правилами. Разработанные программы выдавали настолько плохой перевод, что его невозможно было понять. Проблема состоит в том, что смысл текста на естественном языке зависит не только от самого предложения, но также и от контекста.

Скорее всего, эти первые проекты действительно не дали никаких реальных результатов. Однако были выявлены многие основные проблемы перевода текстов на естественном языке: многозначность слов и синтаксических конструкций, практическая невозможность глобального описания семантической структуры мира даже в ограниченной предметной области, отсутствие эффективных формальных методов описания лингвистических закономерностей и др.

Помимо систем МП как таковых, в целях автоматизации отдельных переводческих операций стали создаваться также более частные «машинные средства» в помощь переводчику и редактору: автоматические словари и терминологические базы данных, компьютерные тезаурусы, средства экранного редактирования, системы орфографической, терминологической и грамматической коррекции текстов. Особое внимание отводилось построению машинных словарей, хотя уже складывались представления об алгоритмах морфологического, синтаксического, лексического анализа для МП.

Наиболее плодотворным можно считать второй период в истории МП – это период с 1960 по 1967 год. Именно в хронологических рамках второго периода началось реальное проявление интересов науки в области МП, впоследствии это привело к тому, что МП стал представлять собой конгломерат всевозможных наук, и не только лингвистического порядка, но и связанных, прежде всего с ЭВМ. Особо следует выделить появление идеи языка-посредника. Однако в то же время пришлось констатировать, что поставленная задача оказалась слишком сложной и что системы автоматического перевода не смогут в обозримом будущем обеспечить

приемлемое качество перевода. Большинство программ машинного перевода увязали в многозначности слов и обилии идиоматических выражений. Начатые работы не привели к практическим результатам, однако выявили многие проблемы перевода текстов, такие как многозначность слов и синтаксических конструкций, практическая невозможность глобального описания семантической структуры мира даже в ограниченной предметной области, отсутствие эффективных формальных методов описания лингвистических закономерностей и др. Параллельно с развитием МП в этот период возникла идея создания автоматического словаря в помощь человеку-переводчику. Автоматический словарь получил практическое применение. В конце 60-х годов XX в. А.К. Жолковский и И.А. Мельчук подняли тему о центральной роли словаря в описании языка. [3, с.17]

Третий период, начавшийся после 1967 г., соединил новые достижения технической кибернетики с новыми результатами теории и практики лингвистических исследований в автоматической обработке текстов. Это соединение произошло на базе осознания социальных потребностей в области МП – преодоления языковых барьеров. Сам МП в рамках этих исследований ушел на второй план и стал рассматриваться скорее как одно из их возможных приложений: служить полигоном для экспериментальной проверки создаваемых логико-математических средств и формально-лингвистических моделей в общем ряду других подобных приложений: информационного поиска, компьютеризованного обучения и т.п.

Интерес к системам машинного перевода вновь был проявлен к 70-м годам, в период интенсивного развития теории искусственного интеллекта и теории «обучения компьютеров пониманию языка», но только в 90-е – благодаря развитию систем искусственного интеллекта, а также персональных компьютеров и появлению реального спроса на машинный перевод – наступило реальное, а главное, подкрепленное рыночными интересами возрождение интереса к системам машинного перевода. 90-е годы можно считать подлинной эпохой возрождения в развитии МП, что связано с высоким уровнем возможностей персональных компьютеров и с распространением Интернета, обусловивших реальный спрос на МП [10, с.175].

После того как машинный перевод превратился в коммерческий продукт, большие усилия стали прилагаться к развитию функциональности системы, которая в программном продукте играет роль, не меньшую, чем наличие хорошо разработанной лингвистической базы. На развитие машинного перевода стали выделяться крупные суммы. Так, за последние 15 лет только японские государственные организации потратили на решение этой проблемы несколько сотен миллионов долларов.

В России подобных инвестиций в развитие систем машинного перевода не было, однако отечественным компаниям, прежде всего компаниям

PROMT и «Арсеналь», удалось добиться заметных успехов не только на российском, но и на мировом уровне. На примере программных продуктов компании PROMT можно проследить тенденции развития машинного перевода сегодня и рассказать об использовании в практической, в т.ч. и учебной деятельности.

Лекция 2. Современное состояние и проблемы машинного перевода

Современное состояние МП характеризуется некоторым слиянием результатов двух подходов, но не механическим соединением результатов, а слиянием их на базе новых моделей, созданных при основном внимании к собственно переводческому аспекту владения естественным языком. Центром исследования в современном МП становится моделирование действий человека-переводчика, особенно в части использования им двух- и многозначных переводных соответствий при переводе с одного языка на другой. МП, возникший вне лингвистики, вошел в нее главным образом благодаря важному аспекту моделирования.

Машинный перевод, прошедший несколько стадий своего развития, в настоящее время сконцентрирован на идее моделирования действий человека-переводчика. Процесс перевода очень труден, а правильное использование преимуществ программного обеспечения во многом определяет качество перевода. Современные системы машинного перевода включают в себя множество дополнительных словарей. Основываясь на особенностях архитектурных решений для лингвистических алгоритмов, системы подразделяются на два типа – «Трансфер» и «Интерлингва». Программы автоматического перевода строятся в соответствии с данным разделением. Так, например программа «Сократ» переводит намного лучше, чем скажем «Маджик Гудди» – лишь потому, что лингвистическое обеспечение первой программы намного сильнее, а словари намного больше по объему. Часто полученные результаты машинного перевода приходится редактировать. Так, например, в программе «Парс» предусмотрена функция дополнительного подключения словарей различной тематики. Ведь от качества обеспечения программы зависит и качество выдаваемого машиной перевода. Но даже тонкая настройка системы под лексику переводимого текста не учитывает всех его особенностей, поэтому переведенные слова, имеющие несколько синонимов, помечаются звездочкой, либо приводятся в скобах как вариант.

Прежде всего машинный перевод – это эффективное средство для просмотра и поиска информации на иностранном языке, а именно эта функция является главной при работе в Интернете. Интернет технологии дали новое развитие машинному переводу, помогли вывести его на новую

стадию развития. Современное состояние машинного перевода позволяет получать относительно корректный текст перевода с большинства языков. И хотя полностью автоматический высококачественный перевод невозможен, мы убедились, что имеется программное обеспечение, которое облегчает сам процесс перевода. В результате настройки на предметную область и интеграции с другими программами обработки документов средство машинного перевода позволяет автоматизировать получение перевода.

Основной проблемой всех программ машинного перевода является правильный выбор тематического словаря, а также выстраивание вспомогательных словарей. На примерах мы разобрали и определили качество перевода текстов различными программами, и пришли к выводу, что перевод частично зависит и от уровня подготовки пользователя (знание языка, навыки работы с программами, чувство языка), а также в большей степени его умения правильно работать с текстовым редактором, вспомогательными утилитами, словарями и фразеологическими справочниками. Таким образом, мы установили, что варианты переводов, производимых с подключением тематических словарей, дают хороший перевод, правильный выбор значения слова и употребление фраз в тексте. Это объясняется тем, что машина настраивает свой словарь на выбор тех синонимов, которые бы соответствовали в большей степени тематике входящего языка, и переводила бы в соответствии с тематикой выходного языка.

Программы машинного перевода лучше обрабатывают научные, технические и образовательные тексты, которым присуще строгое изложение материала. В таких текстах не следует допускать двусмысленности, то есть, можно сказать, что практическое применение машинного перевода при современном качественном уровне самих переводов пока весьма ограничено. Разговорный и публицистический стиль, где много специфических оборотов, но большинство слов используется в прямом смысле, пригодны для ознакомительного перевода, однако для получения грамотного выходного текста требуется ручная правка. Можно сказать, что получаемый перевод является неким ознакомительным текстом, где передается лишь общая тематическая направленность текста.

Перевод же художественной литературы и поэзии не соответствует требованиям машины. Смысл текста, построенного на иносказательных выражениях, при машинном переводе искажается и недоступен даже для ознакомления. Тогда встает вопрос о целесообразности использования машинного перевода. Как отмечалось выше, машинный перевод по своей сути оперирует лишь теми процессами логики, которые заложены в машину. Поэтому машина не понимает многозначности, что в свою очередь приводит к неправильной интерпретации переводимого текста, иногда даже похожему на бессмыслицу. Чтобы избежать таких недоразумений, следует правильно выстраивать тематические словари.

Необходимо проверять текст оригинала на стадии предподготовки его перевода, а затем и редактировать на конечной стадии перевода. Правильное использование программ словарей, а также понимание грамматики и лексики, тематики исходного текста во многом определяет последующее качество перевода на другой язык. Правильное оперирование словарным запасом, клише, словоформами – являются залогом успеха. Если своевременно пополнять специальные словари новыми терминами, то можно получать полностью связный перевод текстов, требующий минимальной стилистической доработки. И, пожалуй, самый главный вывод состоит в том, что многие разработчики программного обеспечения осознали, что кроме хорошо реализованной лингвистики перевода необходима достойная программная реализация.

Очевидный недостаток современных систем машинного перевода (таких, как например, PROMT или SYSTRAN) – их неумение справляться с глубинным семантическим анализом, за исключением отдельных участков текста (фраз). Отсюда происходят многие нелепости, знакомые каждому, кто работал с этими системами.

Например, при переводе на английский язык *катание на коньках* может превратиться в *riding small horses*, предложение *Пионеры катаются на карусели* может быть переведено как *Pioneers go for a drive on a roundabout* или как *Pioneers roll themselves on a roundabout*, а *Matveev's short story* окажется переводом имени *Новелла Матвеева*.

Приведенные примеры показывают, что существующие системы особенно ненадежны при переводе на язык, незнакомый для пользователя. «Ошибок можно избежать только с помощью экспертов, разбирающихся в предметной области и понимающих оба языка. Таким образом, выполненный автоматический перевод может потребовать трудоемкой перепроверки, причем многие фрагменты придется фактически переводить заново. Отчасти сходная ситуация возникает, когда перевод русского специального текста (например, работы по математике) на иностранный язык выполняется профессиональным переводчиком, который специализируется на переводе в обратную сторону и совершенно незнаком с предметом.

Одним из основных принципов разумно организованной системы должен быть известный принцип «принцип бережливости» У. Оккама: не применять сильных средств, если можно обойтись малыми средствами. На практике это прежде всего означает, что системы машинного перевода должны различаться в зависимости от типа поставленной задачи. Можно выделить следующие три типа перевода.

1. Если нужен пословный перевод, то достаточно проводить лишь поверхностный синтаксический анализ; потерянный смысл должен восставливаться пользователем.

2. Напротив, перевод текстов только на уровне прагматики, используемый, например, в разговорниках, не интересуется синтаксисом и почти оставляет без внимания семантику. Наконец, перевод, затрагивающий синтаксические и семантические уровни анализа текста, может нарушать корректность употребления, т.е. содержать ошибки на уровне прагматики.

3. Принцип экономии при переводе состоит в том, что перевод выполняется на поверхностном уровне, если нет необходимости проводить глубокий анализ.

Хороший результат могут дать готовые шаблоны (штампы) и правильный выбор специальных терминов. Вероятно, подобный метод полезен при автоматическом переводе всякого специального текста. Заметим, что сходные принципы перевода используются и в разговорниках. Разумеется, при этом сохраняется риск ошибки стиля [2].

Однако современным системам машинного перевода еще далеко до учета стилистических тонкостей. Даже на поверхностном синтаксическом уровне наблюдаются ошибки в «опасных точках», где два языка отличаются в выборе средств. Например, с точки зрения английского языка глаголы *ask* и *want* одинаково употребляются в конструкциях:

I wanted him to go away и *I asked him to go away*.

При переводе на русский – конструкции совершенно разные: в первом случае требуется глубокий анализ, чтобы получить перевод: *Я хотел, чтобы он ушел*. Во втором же случае имеется очевидный поверхностный перевод: *Я просил его уйти*. Однако система PROMT переводит *Я хотел, чтобы он ушел* как *I wanted that he has left*, но не делает ошибки при переводе *I wanted him to go away* на русский язык.

Другой распространенный тип ошибок при переводе – неправильный выбор словарного эквивалента. Общеизвестны трудности при переводе на иностранный язык с плохим словарем, где предлагается несколько переводов данного слова, но непонятно, какой из них – верный в каждом конкретном случае.

Нужная информация о выборе эквивалента в словарях, как правило, отсутствует. Все известные нам системы машинного перевода делают эту ошибку. Сюда же примыкает проблема перевода фразеологизмов (шаблонов). Например, предложение *Мы сняли дачу* компьютер воспринимает «по-детски» буквально и переводит как *We have removed a summer residence*. Сигнал о выборе возможного варианта здесь может даваться словом дача.

Наконец, заметим, что в сложных случаях возможен уровень представления фразы, использующий лексемы одновременно из двух языков. Замены одних лексем на другие должны производиться с теми же предосторожностями, какие применяются при использовании собственных имен в модальных контекстах.

Лекция 3. Задачи машинного перевода

Работа над программой, которая переводит с одного языка на другой, разбивается на три очевидные подзадачи:

- создать достаточно полный словарь или набор тематических словарей;
- научить систему распознавать не только слова, но и устойчивые обороты;
- формализовать правила перевода с учетом грамматики языков.

Какой словарь нужен машине?

Когда мы переводим текст, например, с английского языка на русский, и находим в словаре незнакомое нам слово, например «computer», то, узнав, что по-русски это значит «компьютер», мы уже безошибочно напишем в зависимости от контекста: «на компьютере», «с компьютером» и т.д. То есть поставим в соответствие не ту совокупность символов, которые прочитали в словаре, а другую!

Это связано с тем, что существительные в русском языке изменяются по падежам и по числам, у одного существительного может существовать до 12 разных форм, а у глаголов и прилагательных количество различных форм, как правило, еще больше. Это означает, что в системе должен существовать некоторый формальный метод описания морфологии, на котором основывается выбор единицы словаря. И соответственно, чем больше словоформ распознает система при меньшем объеме записей в словаре, тем она совершеннее. Чтобы оценить, насколько это сложная задача, скажем, что в системе PROMT морфологическое описание, разработанное только для русского языка, содержит более 800 типов словоизменений.

Известно, что в различных тематиках одно и то же слово переводится совершенно по-разному. Например, английское слово «goat» может переводиться и как «козел», и как «паровой молот» – в зависимости от того, о чем идет речь. Поэтому, видимо, для перевода текстов, имеющих отношение к разным сферам, отраслям и т.д., нужны разные электронные словари.

Однако разбиение по тематикам не решает полностью задачи, например в английском языке отличить в предложении глагол от существительного можно только по смыслу. Так слово «like» может означать «любить», «нравиться» или «похожий», «подобный», и то, что мы безошибочно выбираем в контексте по смыслу, для машины должно быть формализовано.

Одним из понятий, лежащих в основе построения систем перевода, является понятие фрейма, которое было введено еще в 1974 году одним из основоположников исследования методов описания естественных языков

Марвином Минским, высказавшим предположение о том, что человек интерпретирует каждый объект посредством фреймов. Фрейм – это некий набор данных, которым описывается объект. Каждый фрейм содержит отделения или слоты, в которых собраны определенные атрибуты данного объекта. Например, фрейм понятия «кошка» может содержать атрибуты «хозяин», «цвет», «пол», «возраст» и т.д., фрейм понятия «существительное» – атрибуты «род», «падеж» и т.д.

Еще один термин, который необходимо ввести для дальнейших рассуждений, – понятие системы перевода типа TRANSFER, которое подразумевает, что алгоритм перевода основывается на анализе входного предложения в терминах структур входного языка, преобразовании этой структуры в аналогичную структуру выходного языка (TRANSFER) и последующем синтезе выходного предложения по полученной структуре.

Прогрессивным подходом с точки зрения машинного перевода (именно он реализован в системах PROMT) является тот, при котором вместо последовательного процесса анализа и синтеза предложения используется представление процесса перевода как процесса с «объектно-ориентированной» структурой, основанной на иерархии обрабатываемых компонентов предложения.

Система PROMT вместо последовательного «TRANSFER-подхода» использует иерархический подход, разделяющий процесс перевода на взаимосвязанные TRANSFERS для разного уровня. При таком подходе выделяются уровни: лексических единиц; групп; простых и сложных предложений.

1. Первый уровень – лексическая единица – это слово или словосочетание. Слово описывается как совокупность основы и окончания, что дает возможность осуществлять распознавание входных слов и синтез выходных по их морфологической информации, то есть производить TRANSFER на морфологическом уровне.

2. Следующий уровень – уровень групп – рассматривает более сложные структуры (группы существительных, прилагательных, наречий и сложные глагольные формы) и соответственно осуществляет TRANSFER на уровне групп.

3. Третий уровень предусматривает анализ простых предложений как конструкций, состоящих из синтаксических единиц, и выполняется на основе фреймовых структур. На основе так называемой валентности глагола (или способности глагола присоединять соответствующие грамматические формы) определяют заполнение соответствующего фрейма. Для каждого типа фреймов существует некоторый закон преобразования входного фрейма в выходной. Таким образом, осуществляется TRANSFER на уровне простых предложений. Анализ сложных предложений представляет собой еще более неординарную задачу.

Именно эти подходы положены в основу разработки первых программ машинного перевода PROMT, которые появились в 1991 году. Выбранные подходы построения алгоритмов оправдали себя в последующих, более сложных разработках. За последние десять лет компания добилась успехов не только на российском, но и на мировом уровне. Последние достижения PROMT выразились в появлении линии продуктов PROMT 2000, в которых без изменений принципиальных подходов многое было сделано по развитию технологии перевода и организации более дружественных интерфейсов, различных для работы профессионала, домашнего пользователя и исследователя Интернета.

Лекция 4. Функциональные возможности машинного перевода

Функции, которые выполняют различные программы-переводчики, разработанные различными фирмами приблизительно сходны. Рассмотрим достижения технологий машинного перевода на примере программных продуктов компании PROMT. Новое ядро перевода обеспечивает более корректный перевод с учетом морфологических, семантических и синтаксических связей. Различные функциональные возможности предлагаемых программ позволяют оптимально решить проблемы перевода в офисе и в Интернете. Расширились словари (в частности, в новой версии пакета появился англо-русско-английский словарь объемом более 1000000 словарных статей!).

Стало удобнее производить перевод, пользуясь инструментами Microsoft Office. Перевод стал доступен во всех приложениях Word, Excel, Outlook, PowerPoint и FrontPage.

Добавилось количество пар языков перевода. Повысилась эффективность перевода благодаря использованию тематик документа, которые можно сохранить в шаблоне тематики и использовать в дальнейшем при переводе текстов по данной теме.

По ключевым словам система может автоматически подключать тематические словари, а при работе в Интернете – подобрать тематику и направление перевода для определенной Web-страницы.

Новая версия *PROMT Internet 2000* имеет функции перевода, которые встраиваются в Microsoft Internet Explorer 5.x; перевод Web-страниц может осуществляться в браузере-переводчике WebView.

В новой версии домашнего переводчика *Magic Gooddy 2000* появился ряд новых возможностей, связанных с обучением языку и тестированием.

Профессиональная система перевода PROMT Translation Office 2000 – это набор профессиональных инструментов, который в зависимости от вида поставки включает различные пары перевода:

- ✓ английский-русский-английский;
- ✓ немецкий-русский-немецкий;
- ✓ французский-русский-французский;
- ✓ итальянский-русский;

«Гигант» (включает все вышеперечисленные языковые направления).

Система имеет дружественный интерфейс и легка в освоении. В рамках одной системы доступен не только перевод, но и полный спектр сервиса по работе с документами. Система настраивается на перевод конкретных текстов, предоставляет возможность подключения специализированных предметных словарей.

PROMT – модульная система с возможностью выборочной установки необходимых компонентов из восьми доступных, которые предоставляют следующие возможности:

SmarTool – реализует функции перевода в приложениях Microsoft Office;

Mail Translator– встраивается в Outlook 2000;

PROMT – профессиональная среда перевода;

Dictionary Editor – средство создания и коррекции словарей;

Electronic Dictionary (входит только в комплектации «Гигант» и ERRE);

WebView – браузер-переводчик;

QTrans – упрощенный редактор-переводчик;

Clipboard Translator – переводчик текстов буфера обмена;

Интегратор – средство доступа к приложениям семейства.

Профессиональная среда перевода PROMT представляет собой мощный текстовый редактор с настраиваемым интерфейсом в стиле Microsoft Word 2000. Вся работа с исходным текстом и переводом осуществляется в окне документа. Система позволяет не только осуществлять перевод текстов, но и производить весь комплекс офисной работы с документами.

Встраивание перевода в приложения MS Office (SmarTool). Данный компонент реализует функции перевода в приложениях Microsoft Office 2000 и позволяет добавлять полнофункциональное меню перевода в различные приложения Microsoft Office.

Средство просмотра Web-сайтов (WebView) – представляет собой средство просмотра Web-страниц на иностранных языках с автоматическим переводом.

Система обеспечивает сравнительно быстрый онлайн-перевод текста и гиперссылок, позволяет осуществить одновременный просмотр исходной Web-страницы и страницы перевода, сохраняет форматирование при переводе.

Пользователь имеет возможность выбора тематики и направления перевода. Естественно, при наличии графических элементов на странице объем переводимых единиц снижается.

WebView использует новую технологию запоминания тематики для перевода – **SmartURL**, которая заключается в том, что приложение запоминает тематику и направление перевода той или иной переводимой Web-страницы и при повторном обращении использует запоминаемые параметры автоматически.

Настройщик словарей (Dictionary Editor). В процессе перевода ряд слов часто бывает переведен неудачно, а некоторые вовсе не переведены. Эффективность перевода повышается при помещении подобных слов в пользовательские словари или за счет изменений в текущем словаре. Настройка словарей осуществляется с помощью **Dictionary Editor**, имеющего интеллектуальные алгоритмы пополнения словарей.

Электронный словарь (Electronic Dictionary). Интегрированный электронный словарь входит только в комплектации Гигант и в русско-английскую – англо-русскую версии.

Словарь содержит большое количество слов и словосочетаний (около 1000000) из 50 предметных областей, а также дополнительную грамматическую информацию о том, как склоняется данное слово и в каких словосочетаниях оно используется.

Словарь принципиально отличается от традиционной формы представления информации в бумажных словарях, принятой, например, в таком словаре, как Lingvo 6.0.

Основным отличием словаря PROMT является его подход к отбору переводных эквивалентов, при котором многообразие вариантов перевода сведено к двум-трем наиболее употребимым и подходящим в 90 % случаев, а многообразие значений слова компенсируется огромным количеством словосочетаний, включающих это слово. Для нас подобная форма организации словаря как справочного средства показалась несколько непривычной. Хотя, вероятно, использование словарей с разной структурой в профессиональной работе может быть весьма полезно.

Оперативный переводчик корреспонденции (Mail Translator). Это средство для перевода корреспонденции, которое встраивается в Outlook 2000. Указав параметры входящей корреспонденции, пользователь имеет возможность организовать автоматический перевод с сохранением переводов в указанную папку.

Вспомогательные приложения. QTrans – перевод без возможностей форматирования. С помощью данной программы удобно быстро перевести набранный текст или текстовый файл.

Лекция 5. Использование систем машинного перевода в учебе и практической деятельности

Существуют три типа перевода: человеческий, машинный и человеко-машинный. Первый тип, вне всяких сомнений, является самым трудоемким, однако, на первый взгляд, он кажется наиболее надежным, поскольку кто, если не человек, способен адекватно передать смысл, заключенный в тексте? Тем не менее, более внимательный взгляд на проблему позволяет обнаружить, что человеческий перевод по-настоящему ценен или, если хотите, бесценен только в художественной литературе и, отчасти, в публицистике, где важными факторами являются разнообразие и творческий подход. В то же время, научные и технические тексты требуют строгих формулировок и точного следования терминологии, что, согласитесь, временами представляет для человека проблему. Идеальным средством для технического перевода мог бы оказаться компьютер, но в ближайшие годы чисто машинный перевод едва ли найдет серьезное практическое применение в силу сложности, многообразия и недостаточной «формализуемости» естественных языков. Выходом из положения является комбинированный, человеко-машинный перевод, выполняемый при доминирующей роли человека, но с привлечением возможностей вычислительной техники.

В настоящее время грамотному человеку немислимо обходиться без знания иностранного языка. Каждый пользователь ПК, например, периодически сталкивается с тем, что некоторые программы не имеют русского интерфейса, и для корректной работы в данной программе просто необходимы хотя бы базовые знания английского языка. Навигация и общение в Интернете, перевод научных статей, электронная коммерция, участие в международных конференциях, с чем еще предстоит столкнуться нынешнему студенту? В изучении иностранного языка и в практических задачах перевода (не литературного, а как выше уже отмечалось – перевода на поверхностном уровне) безусловно помогут системы машинного перевода, и использовать их надо уже сейчас.

Стремительные потоки информационного обмена между высокоразвитыми промышленными странами, лавина научно-технической документации, поступающая от производителей товаров и современных технологий, требуют совершенно нового подхода к проблеме перевода технической литературы. Выход один: максимально автоматизировать процесс, оставив человеку его творческую редакционную часть. В этом помогает система машинного перевода. Ее параметры должны удовлетворять четырем основным требованиям: оперативность, гибкость, скорость, точность.

Оперативность машинных систем – это возможность постоянного пополнения словарного запаса и создания новых тематических словарей. В этом параметре они значительно опережают привычные типографские издания различных словарей.

Гибкость – это возможность «грубой настройки» на конкретную предметную область (для этой цели служат специализированные словари) и «тонкой настройки» на конкретный текст, книгу или группу документов (модифицируемые пользовательские словари).

Скорость – возможность автоматического ввода и обработки текстовой информации с бумажных носителей. Только одна система оптического ввода текстов (*OCR-System*) ежедневно заменяет более десяти классных машинисток.

Точность – стилистически и грамматически правильная адекватная передача смысла исходного текста на язык перевода. Это наиболее «уязвимое» место систем машинного перевода. Однако столь явное улучшение качества перевода в поздних версиях систем машинного перевода, как например, PROMT 2000, вселяет уверенность, что вскоре компьютер полностью примет на себя всю рутинную часть перевода.

В ы в о д ы

Машинный перевод – это эффективное средство для просмотра и поиска информации на иностранном языке, и именно эта функция является главной при работе в Internet. Далее, в результате настройки на предметную область и интеграции с другими программами обработки документов средство машинного перевода позволяет автоматизировать получение перевода. И наконец, – это уникальный гуманитарный инструмент, позволяющий преодолевать проблемы общения в системах, работающих на разных языках. И пожалуй, самый главный, поистине революционный для прикладной лингвистики вывод состоит в том, что многие разработчики осознали: при создании программы машинного перевода кроме хорошо реализованной лингвистики необходима достойная программная реализация.

Несомненно, средства машинного перевода никогда не смогут улавливать все смысловые нюансы оригинального текста. Различия в синтаксисе и семантике, особенно между западными и восточными языками, – скажем английским и китайским – слишком велики для этого. Даже сторонники машинного перевода признают, что он способен в лучшем случае передать основную суть документа.

Вопросы для контроля

1. Как происходило формирование школы машинного перевода?
2. Каковы принципы машинного перевода середины XX века?
3. Каковы недостатки большинства программ машинного перевода

II половины XX века?

4. Что определяет качество перевода?
5. Что представляет собой машинный перевод?
6. Какие виды текстов машинный перевод осуществляет наиболее удачно? Почему?
7. Соответствует ли требованиям машины перевод художественной литературы и поэзии?
8. Каковы способы предотвращения ошибок перевода?
9. Может ли машинный перевод учесть стилистические аспекты?
10. Какие задачи решает машинный перевод?
11. Каково понятие фрейма, введенное М. Минским?
12. Как реализуется машинный перевод в системах PROMT?
13. Назовите функциональные возможности машинного перевода.
14. Каково практическое использование машинного перевода?

Часть II. СПОСОБЫ ПЕРЕВОДА ОРАТОРСКОЙ РЕЧИ И ГАЗЕТНЫХ ЗАГОЛОВКОВ

Введение

Лекция 1. Особенности перевода ораторской речи

Лекция 2. Перевод газетных заголовков

Выводы

Вопросы для контроля

Введение

Каждая разновидность переводимого материала (под разновидностью понимается жанр) отличается своими специфическими чертами, которые ставят особые требования к переводу. Построение общей теории перевода немислимо без анализа разновидностей перевода, без учета их внутренних особенностей и соотношения их друг с другом. Об этом говорил французский теоретик перевода Эдмонт Кари, рассматривавший вопрос не с лингвистической, а с культурно-познавательной позиции:

«Создание общей теории перевода требует, возможно, полного учета разных видов перевода, существующих в наше время. Оно требует более глубокого анализа каждого из них, взятого не в отдельности и не возводимого в абсолют, а рассматриваемого в связи с другими видами и по отношению к ним. Только теория, смело опирающаяся на все эти факты, возникшие в наш век и столь разнородные на первый взгляд, сможет считаться общей теорией перевода».

Именно путем сопоставления и противопоставления могут и должны быть выявлены черты отличия каждой из разновидностей перевода. Вопросу о различиях в подходе к переводимому материалу была посвящена статья Л.Н. Соболева «О мере точности в переводе», где автор следующим образом выразил свое главное положение: «...мера точности меняется в зависимости от цели перевода, характера переводимого текста и читателя, которому перевод предназначен».

С точки зрения требуемой «меры точности» он рассматривал переводимый материал по трем основным группам текстов – художественных, публицистических и деловых. В качестве критерия точности художественного перевода выдвинута передача разнообразных выразительных средств образности, эмоциональности.

Существует критерий стилистический:

- 1) тексты газетно-информационные, документальные и специально-научные;
- 2) произведения публицистические;
- 3) произведения художественной литературы.

В данной работе рассматривается перевод текста газетно-информационного жанра, составляющими которого являются ораторская речь и перевод заголовков.

Лекция 1. Особенности перевода ораторской речи

Произведение оратора всегда выливается в форму устной речи, но вместе с тем ориентируется и на речь литературную. Выдающиеся произведения ораторской речи (начиная с древней Греции и Рима) сохранились именно в виде литературных текстов, и все то, что мы знаем об ораторах прошлого, мы знаем только по литературному воспроизведению их речей (вне зависимости от того, совпадает ли это воспроизведение с той формой, в какой они были фактически произнесены). С речами современных ораторов – политических деятелей, читатель обычно знакомится по газетной их передаче или по отдельным изданиям. При этом наблюдается, что с одной стороны имеются черты специфические, характеризующие устную речь, как таковую, с другой же стороны, особенности, общие с научной и общественно-политической прозой, т.е. другими словами происходит сочетание устно-речевого и литературно-книжного начала.

Произведения ораторской речи предъявляют всегда определенные фонетические и, в частности, ритмические требования к переводу. При переводе ораторской речи переводчик закономерно ставит себе то же условие, какое ставит себе и оратор, а именно: ориентируется на слушателя. Это практически означает необходимость представить себе текст перевода звучащим, чтобы выявить и устранить трудно произносимые скопления звуков на близком расстоянии, рифмующиеся слова, и наконец, слова и словосочетания, затрудняющие течение фразы при ее произношении. Жанрово-стилистическая специфика подлинника здесь непосредственным образом определяет практические задачи перевода.

Перевод ораторской речи, и как устного выступления, и как литературного текста, подобно всякому другому виду перевода исключает возможность сколько-нибудь буквальной передачи.

Во всякой эмоционально-насыщенной и логически четкой речи важную организующую роль играет синтаксис, параллелизмы и повторения. В известном выступлении английского писателя Ральфа Фокса, посвященном памяти М. Горького, – «Литература и политика» – есть несколько таких мест, где отчетливо выделяются повторения слов или групп слов в начале синтаксического отрезка:

«Gorki's life appears to us today as a great and significant one because his life was bound up with the effort to dethrone that God. Gorki's life was bound up very closely with the past of the working class in Russia, in a period unique in the history of the world, during which that class emerged to freedom a new

society built up on a basis of no private property in the means of production, a society without classes, the first society wherein man has found his full value as a human being»

В существующем русском переводе синтаксическое построение текста сохранено, в частности, все анафорические повторения представлены:

«Жизнь Горького представляется нам сейчас великой и значительной, потому что она была связана с усилием, направленным на низвержение этой богини («богини буржуазного общества»). Жизнь Горького была связана с превращением русского рабочего класса в класс для себя. Жизнь Горького была теснейшим образом связана с прошлым российского пролетариата, в течение единственного по своему значению периода мировой истории, когда этот класс вышел к свободе и к построению нового общества, созданного на основах отрицания частной собственности на средства производства, общество без классов, первого общества, где человек стал полноценным человеческим существом».

В данном примере перевод содержит одним повторением меньше, чем оригинал, в первом же придаточном предложении английское словосочетание «his life» переведено не словосочетанием «его жизнь», или не «это жизнь», а местоимением «она». Это изменение вызвано тем, что полное повторение на столь близком расстоянии было бы назойливым в условиях русского текста, всегда содержащего большее число слов, чем английский, а замена имени собственного в косвенном падеже («Горького») притяжательным местоимением («его») могла бы вызвать ложное осмысление (как будто «его» относилось бы не к Горькому). Отсюда – большая лаконичность этого места в переводе не нарушает принципов перевода ораторской речи.

Перевод ораторского подлинника предполагает воспроизведение индивидуального своеобразия, связанного с творческой личностью автора. Ораторское искусство характеризуется с точки зрения языка двояко. Во-первых, будучи разновидностью литературно-письменной речи, язык оратора сохраняет особенности письменной речи, а именно: развернутые синтаксические структуры, распространенные словосочетания, синтаксические параллелизмы, синтаксические повторы, перечисления и т.д. Во-вторых, язык публичных речей, существующих преимущественно в устной форме, наделен многими особенностями устной речи, а именно: краткими и эллиптическими предложениями, всевозможными присоединенными, разговорными словами, остротами и т.д.

Для публичной речи особенно важны приемы стилистического синтаксиса, так называемые фигуры речи, помогающие достичь экспрессивности и динамичности. В публичной речи велика сила интонаций, которые не только придадут речи нужный динамизм, но и усилят ее выразительность.

Не менее важным компонентом ораторского искусства является остроумие, которое помогает выполнить разные функции в речи: помогает установить контакт с аудиторией (рапорт), восстановить утраченное внимание, но главное – это критика противника, или его воздействий в форме осмеяния (юмор, сатира, ирония, сарказм).

Основными стилистическими качествами публичной речи является правильность, богатство языка, краткость, ясность, точность, уместность, эмоциональность.

Лекция 2. Перевод газетных заголовков

В газетно-информационных материалах имеются и некоторые особенности синтаксической организации текста: наличие кратких самостоятельных сообщений (1–3 высказывания), состоящих из длинных предложений со сложной структурой, максимальное дробление текста на абзацы, когда почти каждое предложение начинается с новой строки, наличие подзаголовков в корпусе текста для повышения интереса читателей, частое использование многочисленных атрибутивных групп. Особенно четко лексико-грамматическая специфика газетно-информационного стиля проявляется в газетных заголовках.

В области лексики для заголовков английских газет характерно частое использование небольшого числа специальных слов, составляющих своего рода «заголовочный журнал»: ban, bid, claim, crack, crash, cut, dash, hit, move, pact, plea, probe, quit, quiz, rap, rush, slash и др. Отличительной особенностью такой «заголовочной лексики» является не только частота их употребления, но и универсальный характер их семантики. Слово pact в заголовке может означать не только «пакт», но и «договор», «соглашение», «сделка» и т.п. Глагол hit может быть употреблен в связи с любым критическим выступлением. Red может означать и «коммунистический», и «социалистический», и «прогрессивный»; bid подразумевает и «призыв», и «приложение», и «попытку достичь определенной цели» и т.д., например:

National Gallery Launches Bid to Buy the Titian – Национальная галерея пытается приобрести картину Тициана; Bid to Stop New Police Powers – Призыв не допустить расширения прав полиции.

В газетных заголовках особенно широко используются жаргонизмы и другие лексические элементы разговорного стиля: Report Raps Lack of Law Reform, Hits GOPers Housing Stand, etc. Даже если в самой статье какая-либо ситуация описывается в более сдержанном стиле, заголовок часто носит более разговорный характер. Например, начало заметки в английской газете: A leading Chinese diplomat has been accused of responsibility for violence against foreign embassies сравним с ее заголовком: China Blames Diplomat for Embassy Rows.

Газетные заголовки обладают и рядом грамматических особенностей. А в английских и американских газетах преобладают глагольные заголовки типа: *Floods Hit Scotland, William Faulkner Is Dead*. Глагольность обычно сохраняется также в заголовках, состоящих из вопросительного предложения: *Will There Be Another Major Slump Next Year?* Специфическая особенность английского заголовка заключается в возможности опустить подлежащее. *Want No War Hysteria in Toronto Schools, Hits Arrest of Peace Campaigners*.

Английские и американские газеты, как правило, используют в заголовках неперфектные формы глагола. Когда речь идет о событиях, происшедших в недавнем прошлом, обычно используют настоящее историческое время: *Russia Condemns West Provocation, Richard Aldington Dies*. Это самый распространенный тип заголовков; употребление настоящего исторического времени придает им живость, приближает событие к читателю, делает его как бы участником этих событий и тем самым усиливает его интерес к публикуемому материалу. *The Past Indefinite* употребляется в заголовках, относящихся к прошлым событиям, в основном в тех случаях, когда в заголовке есть обстоятельство времени, либо, если читателю известно, что описываемое событие произошло в определенный момент в прошлом: *Husband Disappeared Two Years Ago, Why Rockefeller Couldn't Buy a Landslide Victory?* Для обозначения будущего времени в заголовках широко используется инфинитив: *America To Resume Testing, Laundry Workers To Vote on New Contract*.

Важной особенностью английских газетных заголовков является распространенность в них эллиптической формы пассивного залога с опущением вспомогательного глагола *to be* для описания событий как в прошедшем, так и в настоящем времени: *Paris Protest March Staged by Students, All Piers Paralysed on East Coast*.

В газетных заголовках широко представлены названия и политические термины, сокращения и атрибутивные группы, разговорные и жаргонные элементы.

В ы в о д ы

Таким образом, можно сделать следующие выводы по переводу ораторской речи и заголовков.

Речь – публичное монологическое высказывание оратора перед слушателями важная составляющая устного переводчика.

Для переводчика важны следующие моменты при переводе ораторской речи:

1. Речь имеет строгую законченную форму со стройной структурой.
2. Язык речи нормативен, но присутствует эмоциональная информация, для ее передачи используются просторечия, фразеологизмы, метафоры, эпитеты.

3. Системными признаками текста речи являются разного рода повторы: лексические, синтаксические и т. п.

4. Большинство ораторов обладает собственным ораторским стилем. Переводчик должен передать его основные особенности.

5. Публичная речь далеко не всегда заранее подготовлена и это должен учитывать переводчик.

Также следует учитывать при переводе публичной речи и заголовков следующие средства. Это такие, как:

- эмоционально-оценочная лексика;
- модные слова;
- обороты речи, цитаты;
- синтаксис;
- повторы всех уровней: фонетический, морфемный, лексический, синтаксический.
- игра слов, метафоры, сравнение;
- стилистически окрашенная лексика: просторечия, жаргон и др.

Вопросы для контроля

1. В чем заключается понятие «мера точности» перевода?
2. Чем отличается перевод ораторской речи от других видов перевода?
3. Как следует переводить газетные заголовки?
4. Каковы грамматические особенности построения газетных заголовков?
5. На что следует обращать внимание при переводе ораторской речи и заголовков?

Часть III. ОСОБЕННОСТИ ПЕРЕВОДА НЕОЛОГИЗМОВ АНГЛИЙСКОГО ЯЗЫКА

Введение

Лекция 1. Определение понятия и термина «неологизм»

Лекция 2. Выявление значений неологизмов

Лекция 3. Способы перевода неологизмов

Выводы

Вопросы для контроля

Введение

Перевод, как вид духовной деятельности человека, восходит еще к глубокой древности. Он всегда играл существенную роль в истории культуры отдельных народов и мировой культуры в целом. В период после Второй мировой войны – с середины XX столетия – переводческая деятельность во всех своих разновидностях приобрела невиданный ранее размах благодаря все возрастающей интенсивности международных контактов.

Научно-техническая революция, охватывающая все новые области жизни, и связанные с ней международное сотрудничество наук, и другие важнейшие явления цивилизации приводят к небывалому развитию всякого рода контактов между государствами и другими разноязычными обществами людей. В этих условиях чрезвычайно возрастает роль перевода как средства, обслуживающего экономические, общественно-политические, научные, культурно-эстетические и другие отношения народов.

Цель перевода, как ее определяет А.В. Федоров, – как можно ближе познакомить читателя или слушателя, не знающего исходного языка (ИЯ), с данным текстом или содержанием устной речи. Я.И. Рецкер дал переводу следующее определение: «Перевод – это точное воспроизведение подлинника средствами другого языка с сохранением единства содержания и стиля. Этим перевод отличается от пересказа, в котором можно передавать содержание иностранного подлинника, опуская второстепенные детали и не заботясь о воспроизведении стиля. Единство содержания и стиля воссоздается в переводе на иной языковой основе и уже поэтому будет новым единством, свойственным языку перевода» [17].

Перевод – комплексный процесс. Для правильной и точной передачи мысли подлинника нужно не только найти в языке перевода самые подходящие слова, но и облечь их в соответствующую грамматическую форму. К этому еще примешиваются в большинстве случаев и стилисти-

ческие факторы, которые никак нельзя сбросить со счетов. Перевести – значит выразить верно и полно средствами одного языка то, что уже выражено ранее средствами другого языка.

Расхождения в семантических системах разных языков – несомненный факт, являющийся источником многочисленных трудностей. При переводе возникают следующие проблемы:

1. Лексические. Отсутствие эквивалентов в переводящем языке (ПЯ) некоторым единицам ИЯ.

2. Стилистические. Помимо стилистически нейтральных слов, существуют слова и сочетания, употребление которых ограничено какими-то определенными жанрами и типами речи; ситуацией и эмоциональной окраской слова.

3. Грамматические. Отсутствие тех или иных грамматических средств в одном из языков.

Объектом перевода является конкретное речевое произведение (текст подлинника), на основе которого создается другое речевое произведение на другом языке (текст перевода). При переводе необходимо, поняв значение исходного текста, выразить то же самое значение (точнее систему значений) средствами иного языка. При этом неизбежны семантические потери. Необходимо добиться того, чтобы эти потери были сведены к минимуму, т.е. обеспечить максимально большую степень эквивалентности исходного текста и текста перевода, отдавая себе отчет в том, что достижение «стопроцентной» эквивалентности является, по существу, недостижимой задачей, неким идеалом, к которому необходимо стремиться, но достичь которого никогда не удастся.

Выбор эквивалента для передачи значения вновь появившегося слова в переводимом тексте является одной из наиболее сложных задач перевода. Известно, что живой язык находится в состоянии непрерывного изменения и развития, причем самым подвижным его компонентом является словарный состав. Изменению, развитию и увеличению подвержена прежде всего лексика вследствие большей динамичности по сравнению с другими уровнями языка.

Рассмотрим проблему перевода неологизмов – новых слов, появившихся в современном английском языке в связи с новыми открытиями, событиями, достижениями человечества. Определим способы образования неологизмов в современном английском языке, знание которых является основным моментом при осмыслении значения нового слова, а также пути перевода, или скорее передачи неологизмов, при помощи различных видов переводных и непереводных эквивалентов.

Лекция 1. Определение понятия и термина «неологизм»

Неологизмы (neologisms) – это новые слова, появляющиеся в языке и новые значения, возникающие у имеющихся слов.

До сих пор не существует однозначного решения вопроса: за чем можно закрепить понятие неологизма, каковы критерии отнесения той или иной словарной единицы к неологизмам.

При анализе определений понятия «неологизм» различными исследователями становятся очевидными две точки зрения, заключающиеся в том, что термин «неологизм» применяется как к новообразованиям, то есть ко вновь созданным на материале языка, в полном соответствии с существующими в языке словообразовательными моделями словам или словосочетаниям, обозначающим новое, ранее неизвестное, несуществующее понятие, предмет, отрасль науки, род занятий, профессию и т.д. Например, *reactor* – ядерный реактор, *biocide* – биологическая война и пр., так и к собственно неологизмам, а именно ко вновь созданным синонимам к уже имеющемуся в языке слову для обозначения известного понятия, однако несущим коннотативные оттенки, т.е. сопутствующие семантические и стилистические оттенки слова, которые накладываются на его основное значение, а также к словам в новом значении.

Например, слово *boffin* (ученый, занятый секретной работой, чаще всего в военных целях) является близким синонимом слова *scientist*, однако имеет другой семантический оттенок и т.д. Отмечается также некоторая неоднородность состава этих лексических инноваций по причинам своего появления, по своей устойчивости в языке, по частоте употребления, по своей дальнейшей судьбе, когда одни из них прочно входят в язык, а другие являются менее устойчивыми и могут выйти из употребления через какой-то относительно короткий период времени.

«Часто появление новых слов связано с возникновением новых ассоциаций, хотя понятие остается тем же самым, так как язык вообще, лексика в особенности, выполняя свою основную функцию как средство общения, перестраивается, дифференцируется и уточняется с тем, чтобы более адекватно отразить, воспроизвести и закрепить новые понятия в соответствующих словах и выражениях» [24]. Неологизмы не всегда фиксируются словарем. Появляющиеся на периферии языковой системы неологизмы какое-то время находятся в распоряжении этой периферии и лишь постепенно, да и то не все, а наиболее отвечающие структурным требованиям слова языка, перемещаются к центру языковой системы, к основному словарному фонду.

Новообразования же, если и возникают на периферии, то гораздо быстрее (а порой и сразу) проникают ближе к центру, являясь востребованными и незаменимыми, активно входят в словарный состав. Новообразования появляются, как правило, в языке науки, техники,

культуры, политики и проникают в разговорную речь. Поскольку временной критерий для выделения новообразований и неологизмов объективно определить невозможно, то имеет смысл воспользоваться субъективным критерием: воспринимает ли коллективное (и собственное) языковое сознание ту или иную лексическую единицу как новое.

Лекция 2. Выявление значений неологизмов

Использование словарей для выяснения значения неологизма

Основная трудность при переводе неологизмов – это выяснение значения нового слова. Собственно перевод неологизма, значение которого уже известно переводчику, задача сравнительно более простая, и решается она путем использования различных способов в зависимости от того, к какому типу слов принадлежит данный неологизм.

Если новое слово отсутствует в англо-русском словаре, то следует попытаться найти его в англо-английском толковом словаре. Во многих широко известных словарях существуют разделы «Новые слова» (New Words Section). При этом рекомендуется пользоваться словарями самых последних изданий. Многие неологизмы можно найти в словарях и разделах, посвященных сленгу. Следует иметь в виду, что наиболее оперативно подготавливаются и издаются словари малого и среднего объема, однако в силу ограниченности своего словника они не в состоянии удовлетворить потребностей профессионала.

Тем не менее, словари по объективным причинам не могут в полной мере отражать в своем словнике все вновь появляющиеся слова, хотя бы потому, что лексикографы остерегаются включать в словари так называемые «окказиональные» неологизмы, т.е. индивидуальные новообразования, вводимые отдельными авторами для данного случая. Такие слова часто оказываются «нежизнеспособными» и так же быстро исчезают, как появляются.

Выяснение значения неологизма из контекста

Исходя из определения термина «неологизм» можно предположить, что переводчик, впервые встречая собственно неологизм, естественно не имеет представления о понятии, обозначенном им. Поэтому значение неологизма приходится выяснять чаще всего из контекста. При письменном переводе контекст, как правило, довольно информативен.

В процессе перевода слова обычно выделяют два этапа:

- 1) выяснение значения слова в контексте;
- 2) передача этого значения средствами ПЯ.

В случае перевода неологизма, как уже говорилось ранее, первый этап играет решающую роль, а последний есть лишь чисто технический вопрос, хотя и его важно решить методами наиболее приемлемыми для ПЯ.

В пределах общего понятия контекста различается узкий контекст (микрконтекст) и широкий контекст (макрконтекст). Под узким контекстом имеется в виду контекст предложения, то есть лингвистические единицы, составляющие окружение данной единицы, не выходящие за рамки предложения; широкий контекст – это совокупность языковых единиц, окружающих данную единицу в пределах, лежащих вне данного предложения, иными словами, в смежных с ним предложениях. Точные рамки широкого контекста указать нельзя – это может быть контекст группы предложений, абзаца, главы или даже всего произведения (например, рассказа, статьи или романа) в целом. Очень важно при выяснении значения неологизмов принимать во внимание как раз макрконтекст, поскольку именно в нем может содержаться «подсказка».

Узкий контекст, в свою очередь, можно разделить на контекст синтаксический и лексический. Синтаксический контекст – это та синтаксическая конструкция, в которой употребляется данное слово, словосочетание или предложение. Лексический контекст – это совокупность конкретных лексических единиц, слов и устойчивых словосочетаний, в окружении которых встречается данная единица.

Учет синтаксического контекста позволит переводчику определить принадлежность неологизма к одной из частей речи, однако при уяснении значения неологизма решающим является учет именно лексического контекста.

Анализ структуры неологизма для уяснения значения неологизма

Новые слова, как правило, возникают на базе уже существующих в языке слов и морфем. Анализ этих слов и морфем может оказать переводчику серьезную помощь в уяснении значения неологизма. Для этого необходимо хорошо знать способы словообразования в английском языке. Рассмотрим, как происходит словообразование неологизмов.

- *Придание уже существующему слову еще одного значения.*

Например, слово *call* в английском языке означает «называть», «вызывать, призывать»; «созывать», «вызов», «телефонный звонок» и др. Однако с развитием биржевого дела не так давно у слова *call* появилось новое значение, зафиксированное в словарях как «колл, опцион колл» (т.е. право купить в течение определенного срока ценные бумаги по обусловленной цене с предварительной уплатой премии), а с развитием банковского дела появляется еще одно значение – «требование банка к заемщику о досрочном погашении кредита в связи с нарушением его условий».

- *Словосложение.*

Одним из наиболее древних, универсальных и распространенных способов словообразования в английском языке является словосложение, не утратившее своей активности и в настоящее время: более одной трети всех новообразований в современном английском языке – сложные слова. Процесс словосложения представляет собой соположение двух основ, как правило, омонимичных словоформам. Например, в экономических текстах *carryback* – «перенос убытков на более ранний период», *citiplus* «инструмент хеджирования, предлагаемый клиентам банком «Ситибэнка» (США)» и т.д. Поскольку нормы современного английского языка позволяют сочетание слов, обладающих теми же лексико-грамматическими характеристиками, что и соединяемые при словосложении основы, то определить, в каких случаях переводчик имеет дело со сложным словом-неологизмом, а в каких – со словосочетанием, представляется довольно трудным. Сравним словосочетания *closing bank* – «банк, завершающий сделку, в которой участвовало несколько банков», *unclosing bank* – «закрывающийся банк» и т.п.

В настоящее время разработан ряд критериев для разграничения сложных слов и словосочетаний. При переводе неологизмов в английских текстах особого внимания заслуживает орфографический критерий, суть которого заключается в рассмотрении всякого комплекса, написанного слитно или через дефис, как сложного слова, а комплекса, чьи компоненты пишутся раздельно, как словосочетания:

dividend-right certificate – «сертификат, дающий право на получение дивиденда»;

dear-money policy – «ограничение кредита путем повышения процентных ставок»;

fill-or-kill order – «приказ клиента брокеру, который должен быть немедленно исполнен или аннулирован».

В случаях, когда соединяют слова, оканчивающиеся и начинающиеся на одну и ту же гласную или согласную, одна из них опускается: *net + etiquette = netiquette* «неписанные общепринятые правила общения или размещения информации в Интернет», т.е. этикет для сети Интернета.

Тем не менее необходимо отметить, что во многих случаях наблюдается непоследовательность в написании даже одного и того же комплекса. Например, исследование текстов показали, что в случае с написанием *man-made* – «искусственный, созданный человеком» обнаружено, что 6 % – раздельное написание, 82 % – через дефис, 12 % – слитное написание. Анализ компонентов, входящих в состав сложного слова, дает переводчику возможность, зная их лексическое значение, выяснить значение всего комплекса:

Graphite bombing caused power lines destruction turning off *life-supports* in Belgrade hospitals (Fox News Direct, 1999). Как видим, неологизм *life-*

supports состоит из двух слов *life* («жизнь») и *support* («поддерживать»), значит, речь идет о чем-то, что позволяет поддерживать жизнь или жизнеспособность, причем суффикс *-s* указывает на то, что мы имеем дело с исчисляемым существительным в форме множественного числа. Таким образом, приняв во внимание контекст, этот неологизм можно перевести как «аппаратура жизнеобеспечения».

Все предложение переводится следующим образом: Во время бомбардировки графитными бомбами были повреждены линии электропередачи, что стало причиной отключения аппаратуры жизнеобеспечения в больницах Белграда.

- *Образование форм неологизмов по аналогии с уже имеющимися в языке путем прибавления к ним различных продуктивных аффиксов.*

Для правильного понимания значения образованных таким путем неологизмов переводчику необходимо знать продуктивные аффиксы в современном английском языке и уметь правильно членить слово на компоненты:

kiteflyer – «получатель денег под фиктивный вексель, пользователь фиктивного векселя» (ср. *fly kites* «использовать фиктивные чеки для получения средств до их инкассации»).

Очень часто при подобном способе образования неологизмы имеют сатирическую окраску, особенно в прессе:

...that they taste the same in Peking as they do in London or New York, and so it was that world burgeronomics was born by McDonald's. (The Independent, 1998).

В данном случае автор статьи хочет обратить внимание читателя на значительное развитие сети ресторанов «Макдональдс» – индустрии быстрого питания, где существуют свои законы и явления и подобно другим экономическим законам одинаково действуют в разных странах: ...что в Пекине они по вкусу такие же, как и в Лондоне или Нью-Йорке, вот так «Макдональдс» создала мировую гамбургерномику.

- *Конверсия.*

Конверсией называется функциональный переход слова из одной части речи в другую, т.е. употребление одного и того же слова в качестве разных частей речи. Однако некоторые ученые (А.И. Смирницкий, В.Н. Ярцева) считают конверсию актом словообразования, когда образующиеся слова омонимичны своим производящим базам, но отличаются от них парадигмами. Так, например, сейчас в сети Интернета можно часто видеть фразы: *E-mail me/us to...* Уяснение значения подобного неологизма не представляет труда. Синтаксический контекст дает возможность определить принадлежность слова к переходным глаголам, и, зная значение слова *E-mail*

(электронная почта), переводим: Высылайте сообщения электронной почтой по адресу...

- *Заемствование из других языков.*

Рассмотрим, как происходит заимствование. Сравним предложения на английском:

Then his *telefonino* rang, or rather squeaked piercingly... It is impossible to get away from the wretched *telefonino* wherever you are in Italy. Of all the countries in Europe, only Britain has more mobile telephones. (The Independent, 1998) и их перевод:

Затем зазвонил, или скорее пронзительно запищал его *мини-телефон*. В какой бы части Италии вы ни находились, вам никуда не деться от этих назойливых *телефонино*. Из всех европейских стран, мобильных телефонов больше только в Великобритании.

Вот еще один пример:

The Soviets had *Sputnik*, but the Americans had their open-plan kitchen. No contest. (The Independent, 1998)

Советский Союз создал «*Спутник*», а американцы создали кухню открытого типа. Вне конкуренции.

Как видим, слова заимствуются из одного языка в другой.

- *Обратная деривация.*

Обратная деривация представляет собой процесс образования глаголов путем усечения суффикса от коррелятивных имен существительных типа *televise* «показывать по телевидению» от *television* «телевидение».

- *Сращение.*

Сращение – соединение либо усеченного корня одного слова с целым словом, либо соединение двух усеченных корней:

forex reserve (*forex* = *foreign* + *exchange*) – «резервы в иностранной валюте»;

impex transactions (*impex* = *import* + *export*) – «экспортно-импортные сделки».

- *Аббревиация.*

Среди существующих видов этого способа словообразования особого внимания заслуживают частично сокращенные инициальные сокращения, суть которых состоит в инициальном сокращении одного из элементов конструкции, например, *B-unit* (*Barclays currency unit*) «международная денежная единица банка «Барклейз бэнк интернешнл», *Fed Wire* – «система электронной связи федеральных резервных банков (США)» и т.п.

Таким образом, мы видим, что существуют различные способы образования неологизмов. Для того, чтобы выяснить, какое значение имеет неологизм, необходимо проанализировать его состав и этимологию. Только после внимательного анализа неологизма можно выполнить его адекватный перевод.

Лекция 3. Способы перевода неологизмов

Существует несколько способов передачи неологизмов средствами русского языка:

- *Транскрипция, транслитерация.*

Существуют квазибеспереводные методы передачи неологизмов. Они названы так потому, что при использовании этих приемов процесс перевода как бы обходится и заменяется актом заимствования звуковой (при транскрипции) или графической (при транслитерации) формы слова вместе со значением из ИЯ в ПЯ. Однако беспереводность этого приема на самом деле только кажущаяся: фактически здесь заимствование осуществляется именно ради перевода как необходимая предпосылка для его осуществления.

Заимствованное слово становится фактом ПЯ и уже в качестве такового выступает как эквивалент внешне идентичного с ним иноязычного слова. По существу этот путь является одним из древнейших и самых распространенных на стадии естественных (дописьменных) языковых контактов, но он продолжает играть немалую роль и в настоящее время. Правда, применение этого приема в наше время связано с целым рядом ограничений (языковая политика, стилистические нормы, традиции различных социолингвистических коллективов и т.п.).

Метод *транслитерации* заключается в том, чтобы при помощи русских букв передать буквы, составляющие английское слово, например, *Nikkei* – «Никкей» (индекс курсов ценных бумаг на Токийской фондовой бирже) и т.д. Транслитерация широко использовалась переводчиками вплоть до конца XIX века. Для этого переводчику необязательно было знать произношение английского слова, и он мог ограничиться его зрительным восприятием.

Значительно большее распространение в переводческой практике настоящего времени имеет прием *транскрибирования*, который заключается в передаче не орфографической формы слова, а фонетической. В силу значительного отличия фонетических систем русского и английского языков, такая передача всегда несколько условна и воспроизводит лишь некоторое подобие английского звучания. Переводчику следует всегда иметь в виду, что при использовании приема транскрипции всегда имеется элемент транслитерации.

- *Калькирование.*

Среди собственно переводных способов в отдельную часть выделяется калькирование, которое занимает промежуточное положение между полностью переводными и беспереводными способами передачи неологизмов. «Беспереводность» калькирования проявляется в сохранении неизменной внутренней формы слова (ср. сохранение неизменной внешней

формы при беспереводной передаче). Калькирование предполагает существование двусторонних межъязыковых соответствий между элементарными лексическими единицами, которые и используются в качестве «строительного материала» для воссоздания внутренней формы заимствованного или переводимого слова.

Калькирование как прием создания эквивалента сродни буквальному переводу – эквивалент целого создается путем простого сложения эквивалентов его составных частей. Отсюда следует, что калькированию подвергаются только неологизмы сложного слова. К примеру, слово *multicurrency* состоит из двух составляющих компонентов *multi* и *currency*, оба по отдельности могут быть переведены как «много-» (префикс, обозначающий множественность) и существительное «валюта», при их сложении получается термин «многовалютный (например кредит)» или *interbank (market)* = префикс *inter-* («меж-») + существительное *bank* («банковский») т.о. создается неологизм – «межбанковский (рынок)».

Преимуществом приема калькирования являются краткость и простота получаемого с его помощью эквивалента и его однозначная соотносительность с исходным словом, доходящая до полной обратимости соответствия. Хотя эквиваленты-кальки «страдают» буквализмом, краткость и потенциальная терминологичность делает их весьма привлекательными для использования в газетно-публицистических и общественно-научных работах.

- *Описательные эквиваленты.*

Описательные эквиваленты относятся к некалькирующим способам передачи неологизмов и принципиально отличаются от кальки тем, что в описательных способах передачи неологизмов инвариантом перевода является именно значение иноязычной единицы безотносительно к характеру его связей с внешней структурой слова, в то время как при калькировании инвариантом перевода является форма единицы ИЯ (правда, не звуковая или графическая, как при транскрибировании или транслитерации, а лексическая или лексико-морфологическая), содержательная сторона остается как бы «за скобкой».

Другими словами, описательный перевод состоит в передаче значения английского слова при помощи более или менее распространенного объяснения. Этот способ можно применять как для объяснения значения в словаре, так и при переводе неологизмов в конкретном тексте. Описательный перевод осуществляется различными способами. Рассмотрим два случая.

1. Биржевой термин *open outcry*, используя калькирование, можно было бы передать как «открытый выкрик», не смущаясь буквализма, поскольку всем известно, что на бирже необходимо очень быстро реагировать на спрос и предложение, и при назначении цены, для того чтобы опередить конкурентов, не кричать просто невозможно. Однако такой способ пере-

дачи (а уж тем более транскрибирование или транслитерирование) является неприемлемым, так как не раскрывает значения этого слова. В данном случае наиболее подходящим приемом был бы описательный перевод.

Итак, за значение термина можно принять объяснение в достаточно авторитетном толковом словаре ИЯ. Так, в словаре *The Oxford Dictionary for the Business World (1993)* значение термина *open outcry* разъясняется как «*a meeting of commodity brokers with dealers in order to form a transaction. Traders usually form a ring around the person shouting out bids and offers*». Перевод в данном случае будет звучать так: *метод биржевой торговли путём прямого контакта продавца и покупателя*.

Рассмотренный на данном примере способ описательного перевода называется объяснительным, поскольку в эквиваленте как бы объясняются существенные элементы значения переводимого слова. Объяснительный перевод стоит ближе к толкованию слова, но он все же остается переводом и пригоден для использования в реальном тексте. Однако даже при оптимальном подборе объяснительного эквивалента ему присущи такие недостатки, как многословность и некоторая факультативность эквивалента в ПЯ.

2. Прием описательного перевода может быть воплощен и другим способом. *Подстановочный перевод* – прием передачи неологизма, при котором в качестве его эквивалента используется уже существующее в ПЯ слово (или словосочетание), не являющееся в нем неологизмом, но обладающее достаточной общностью значений с исходным словом. В идеальном случае здесь может быть достигнута семантическая конгруэнтность, т.е. совпадение объема денотативных значений (при неизбежном расхождении в некоторых коннотативных элементах). Примерами такого полного совпадения объемов значений в пределах пары лексикографических соответствий могут служить: *order interval* – «цикл заказа» (интервал между последовательными заказами), *managed floating rate* – «корректируемый плавающий курс».

Совпадение объемов значений – относительно редкий случай. Гораздо чаще при подстановке происходит семантическая трансформация, т.е. слово на ИЯ передается словом ПЯ, значение которого отличается своим объемом или содержанием. Такая трансформация может быть либо концентрической, либо смещенной. В первом случае происходит сужение или расширение значения при замене слова на ИЯ его ПЯ-эквивалентом. Во втором – неполное совпадение значений коррелирующей пары слов по содержанию.

Примером концентрической трансформации может служить *transition country* – «страна с переходной экономикой» (происходит сужение значения; дословно – «страна перехода»), *industrial country* – «промышленно-

развитая страна» (произошло сужение значения; дословно – «промышленная страна»).

Эквиваленты со смещенным значением среди подстановочных эквивалентов встречаются довольно часто, что вполне естественно, поскольку прием подстановки по существу используется именно тогда, когда в сопоставляемых языках нет конгруэнтных между собой пар лексических эквивалентов. Например, *exchange rate* – «обменный курс» (дословно – «обменный уровень»).

В ы в о д ы

Неологизм должен восприниматься как нормальное языковое явление, и отсутствие слова в словаре не может служить препятствием для его перевода, к тому же именно переводческая практика делает наибольший вклад в пополнение лексического состава языка перевода новыми словами, приходящими из других языков, а отсюда и словников двуязычных словарей. В любом случае, когда известно значение нового слова, имеется возможность передать его при помощи рассмотренных способов.

Итак, процесс перевода неологизмов с английского языка на русский проходит в два этапа:

1) выяснение значения неологизма (когда переводчик либо обращается к последним изданиям английских толковых (энциклопедических) словарей, либо уясняет значение нового слова, принимая во внимание его структуру и контекст);

2) собственно перевод (передача) средствами русского языка, а именно: транскрипция, транслитерация, калькирование, описательный перевод (объяснительный или подстановочный, при использовании последнего способа можно наблюдать как полное совпадение денотативных значений, так и сужение или расширение значения слова ПЯ, или же неполное совпадение значений пары слов ИЯ и ПЯ).

Что касается выбора того или иного способа передачи неологизмов, то он зависит от многих субъективных факторов (они не были рассмотрены в работе именно по причине своей субъективной природы), таких как, например, личность переводчика, его опыт, интеллект, способность оперировать абстрактными понятиями, обстановка во время процесса перевода, а также от стиля текста (публицистический, научный, художественный и т.д.), стиля конкретного автора и пр. Однако прежде всего необходимо стремиться к тому, чтобы эквивалент неологизму ИЯ (английского языка) в максимальной степени отвечал нормам и правилам языка перевода (русского языка), если осуществляется перевод на русский язык.

Вопросы для контроля

1. Что такое перевод?
2. Какова цель перевода?
3. Какие проблемы и трудности перевода существуют?
4. Что такое объект перевода?
5. Какие слова называются неологизмами?
6. Какие 2 этапа выделяют при переводе неологизмов?
7. Как происходит словообразование неологизмов?
8. Назовите способы перевода неологизмов.
9. Каковы способы осуществления описательного перевода?

ПРИЛОЖЕНИЯ

Приложение 1

ТЕХТ 1

1. Прочитайте текст, стараясь понять его содержание.
2. Выполните реферативный перевод текста.
3. Напишите перевод-аннотацию.

History of architecture in Britain

The history of architecture in England between 1500 and 1800 can be seen as a series of stages defined by the interests of patrons and, within the forms of the buildings themselves, by the variety of responses possible to the forms of Renaissance architecture in continental Europe. In such a history, England always had problems in its cultural and political relations with other countries, Italy in particular. In addition, there was the Reformation, which, after the early 1500s, led to an immediate decline in ecclesiastical architecture. Throughout this entire period, problems of royal patronage also existed. If in France or Italy new traditions of design had been established by those in authority, in England the parlous state of the finances of the monarchy, even with two extremely active patrons, King Henry VIII and King Charles I, always severely limited what was built.

England is geographically far from Italy. Some of the early forms of Italian design were known almost immediately, but until the end of the sixteenth century most of what was built in England was still based on the local traditions of Gothic building. It was only later that there were sufficient masons and craftsmen trained in the ways of Renaissance architecture to know how to incorporate it effectively into whatever they built.

Of the architecture constructed for Henry VIII, the most important surviving example is Hampton Court, confiscated from Cardinal Thomas Wolsey in 1529 and then extended; most notable is its Great Hall, where the structure was still essentially Gothic but much of the ornamentation – the *putti*, scrolls, and balusters, as well as other details elsewhere in the palace – hinted at a newer style from Italy. At Nonsuch Palace in Surrey, begun in 1538, there was a clear attempt to rival Chambord, built by King Francis I a decade earlier; though the plan of two great courts there was traditional, for many of the decorative details foreign craftsmen were brought in, some of whom, like Nicholas Bellin, had worked at Fontainebleau in similar ways.

Tudor architecture was still largely Gothic. But the plans of the buildings, seen in historical context, tended now to be symmetrical; the blocks were seen as individual units, rather than being brought together under the form of linear patterning that had been so much a part of the older English style. To make the effect very different from what had been built even fifty years earlier, new forms

of decoration also appeared: simple octagonal towers, polychrome brick, niches, plaques, and decorated chimneys. They may be observed at Barrington Court, Somerset (1515–1548), Compton Wyngates, Warwickshire (c. 1520), and Sutton Place, Surrey (1523–1527).

The next great period was that of Elizabethan architecture, as seen in the large manor houses and great courtly houses built from the 1560s onward, often by newly wealthy merchants or courtiers and ministers of state. Some important examples are Wollaton Hall, Nottinghamshire (1580–1588), Longleat Hall, Wiltshire (1572), Burghley House, Northamptonshire (1577–1585), and Hardwick Hall, Derbyshire (1590–1597). The style and plans of these houses, in their symmetry and details, were more clearly indebted to Renaissance architecture. If the windows now often took up much of the wall, the decorations around them, taken as much from Flanders as from Italy – the false niches and strap-work, the grotesques and broken columns – had a new visual power and seemed to mirror perfectly, as if in heraldry, the power and new wealth of their owners. It was also at this time that the first two English architects became known by name: Robert Smythson (1535–1614), the designer of Hardwick and Wollaton, and John Thorpe (1568–1620), many of whose drawings have survived. But still the play between native traditions of masonry building and new forms of Italian design took time to be worked out. Notable examples of this mixed style, often referred to as Artisan Mannerism, can be seen at Hatfield House, Hertfordshire, begun in 1607; a collegiate building like Wadham College, Oxford, built from 1610–1613; and Swakeleys, Middlesex, built in 1638.

All of this was to change quickly with Inigo Jones and the patronage he received from King Charles I. Jones had been to Italy, and his books and notes show how well he learned the principles and practice of the new architecture. If in the end he was able to design only a few completed buildings, such as the Queen's House, Greenwich (1616–1639), and the Banqueting House, Whitehall (1616–1639), the simple classical style he used for them, based on the example of Andrea Palladio, was to transform completely the idea of architectural design in England. He also produced a number of designs, never built, for country houses, and these are reflected in the plain, astylar (without columns) character of buildings like Thorpe Hall, Huntingdonshire (1653–1656), and Lees Court, Kent (c. 1640). And in the houses designed for the duke of Bedford at Covent Garden (begun in 1631), Jones established a style of urban architecture that was to influence much of what was built in cities in England for the next two centuries.

However, it was the work of Christopher Wren and that of the next generation of architects – Hugh May, Robert Hooke, and others – that finally fully established the style of classical architecture in England. And in Wren's work, whether for colleges at Oxford and Cambridge, or at Greenwich, or again at Hampton Court, and then in numerous city churches and St. Paul's Cathedral,

a version of the baroque was brought to England, rich and grand enough to be comparable to what was available in the other countries of Europe.

A battle of styles was to nevertheless continue. After Wren, there was in the work of Nicholas Hawksmoor and Sir John Vanbrugh – as at Blenheim Palace, Oxfordshire (1704–1725), or St. Anne's, Limehouse, London (1714–1724) – a grand classical style, in its effect recalling something of Elizabethan architecture, but against this was now set the Palladianism advocated by Lord Burlington. It effectively brought English architecture back to the classical roots of Palladio and the designs of Jones. Burlington was himself an architect and a powerful and tireless patron of art. At Chiswick House, London (begun in 1725), Wanstead House, Essex (1713–1720), and Holkham Hall, Norfolk (begun in 1734), he was able with the help of Colin Campbell and William Kent to define a tradition of apparently replicable, classicizing architecture that, with new ideas about the natural landscape taken from Rome and even China, gave both architects and new patrons alike firm ideas about designing buildings and gardens that would be socially and intellectually acceptable.

However, all of this was happening at a time when familiar concepts of beauty were beginning to be questioned by philosophers like David Hume and Edmund Burke. And with the political and cultural changes taking place in Europe, classical buildings even beyond those of Italy were now accessible to anyone interested in travel and a fresh view of the history of architecture. In this regard, Greece was to become very important. Despite the fact that with figures like Sir William Chambers and Robert Adam, by the end of the eighteenth century, architects were working more professionally, with full offices and staffs, there were also many more theoretical disputes about the propriety of styles: whether the refined traditions of Italy should remain the model, or the simpler and more primitive styles of Greece were superior. The result, especially as the eighteenth century came to an end, was a mix of styles, with some architects like Chambers still working in an Italianate style, as at Somerset House, London (1776–1780), and others preferring a simpler Greek style, as at Dover House, London (1787), designed by Henry Holland. Other architects, such as Horace Walpole at Strawberry Hill, London (1748 onward), or James Wyatt at Fonthill Abbey, Wiltshire (1795–1807), developed a new version of the native Gothic style that elicited very different responses from those engendered by the purer, more rational classicism of the new Palladianism.

There was no one way to resolve these differences, especially when other stylistic elements were soon to appear, as in the garden buildings at Kew, designed in the 1770s and 1780s, and clearly influenced by the buildings of Moorish Spain, the architecture of India and China, and the Gothic past of England. The last great classical architect in England was Sir John Soane; in buildings like the Bank of England, London (1792–1793), or the library in his home at 12 Lincoln Inns Fields (1792), he suggested an architecture that was at once deeply individual, yet recalled the traditions of a native yet distinctly Roman style that had been used by Vanbrugh and Hawksmoor. This was a

moment of stylistic eclecticism, but it was from these possibilities that architecture could develop as it did in the next century, using new materials of glass and iron, and often for structures like bridges, railway stations, and factories, in a classical style, one completely different from what had developed when Renaissance architecture was first brought to England.

TEXT 2

1. Прочитайте текст, стараясь понять его содержание.
2. Выполните реферативный перевод текста.
3. Напишите перевод-аннотацию.

History of landscape construction

Landscape construction traces its roots to the early public parks in Europe and Great Britain. Since parks were popular places for carriage rides, leisurely strolls, and courtship rituals, they needed to be imbued with a sense of culture and civilization while, at the same time, preserve and maintain the unspoiled beauty of Mother Nature. This involved defining broad paths for horses and pedestrians, constructing bridges over streams, clearing away unsightly rocks and dead trees, and providing benches and shelters for people to respectively rest and get out of the rain. Unless one was wealthy and had servants to tend to their private gardens, individuals who lived in cities had little more than window boxes to «dress up» the exteriors of their dwellings; those in rural regions only planted vegetation that could be harvested and sold. Not until the advent of residential suburbs did homeowners finally have front and backyards that could be landscaped – a scenario that continues to require them to consult a professional to help them get it right and hire a gardener to keep it from becoming overgrown.

Types

- There are three types of landscape construction. The first is residential, which involves properties that are meant to be lived in by individuals and families. These can be anything from a cozy bungalow to a Beverly Hills mansion to an apartment or condominium complex. The second kind of landscape construction pertains to commercial facilities such as office buildings, restaurants, shopping malls, amusement parks, golf courses and stores. The third type is environmental design. A botanical garden, for instance, would fit this model because it's not only an educational setting where visitors can learn about indigenous plants but also where horticultural experts can effectively study the challenges impacting a region's fragile ecosystems.

Considerations

- Most people who enter the field of landscape construction as a career have a degree/expertise in horticulture, botany, environmental science, engineering, or architectural design. Although a lot of their time is spent outdoors in

overseeing a landscape project from start to finish, much of the preliminary planning is now done indoors with CAD (computer-aided design) software programs. Instead of the olden days of sketching out a concept on a piece of graph paper, a landscape designer can define the dimensions directly on the screen, generate a complete irrigation network, and create a color simulation of what the finished garden will look like. Further, there are programs that can even project what the trees and shrubs will look like in the next 5, 10 or 20 years. The ability to run these computer simulations is an enormous cost benefit to the client because they can see in advance if the plan is pleasing to the eye before a single spade of dirt is even turned.

Misconceptions

- The most common misconception about the landscape construction business is that it's all about «mow, blow, and go». In other words, once the property has been landscaped, that's probably the last that will ever be seen of the designer. While there's no shortage of technicians who do things on the cheap and quickly move on to their next project, the ones who are successful in this business have a vested interest in ensuring that the fruits of their labor continue to look spectacular and won't unravel into a jungle that can only be traversed with a machete. Accordingly, landscape designers need to be sensitive regarding the use of plants that are low maintenance/low water, irrigation that's designed for maximum efficiency/minimal waste, materials that come from recycled, renewable or sustainable resources, and projects that can be approached in an environmentally conscientious manner to create beautiful sanctuaries. Likewise, regions of the country that allow its population to embrace a lifestyle largely spent outdoors have resulted in a high demand for designers who are well versed in the construction of patio decks, waterfalls, outside fireplaces, koi ponds, barbecues, gazebos, fire pits and exterior lighting systems.

Expert Insight

- The following books are not only great resources for the do-it-yourself gardener but also provide a full spectrum of layout designs to give you a starting point when discussing your landscaping vision with a professional:

«Sustainable Landscape Construction: A Guide to Green Building Outdoors» by J. William Thompson and Kim Sorvig;

«Landscape Construction: Procedures, Techniques, and Design» by Floyd Giles;

«Landscaping Principles and Practices» by Jack Ingels;

«Master Landscape Pro and Home Design» (software) by Punch! Software;

«Start-to-Finish Landscape Construction» by Ortho;

«Landscapes Estimating & Contract Administration» by Stephen Angley, Edward Horsey, and David Roberts;

«Landscaping for Dummies» by Phillip Giroux, Bob Beckstrom, Lance Walheim, and The Editors of the National Gardening Association.

ТЕХТ 1

Задание 1. Прочитайте текст, стараясь понять его общее содержание.

Задание 2. Выполните полный письменный перевод текста. Объясните, какие переводческие трансформации вы используете.

Central heating

Central heating unit



A central heating system provides warmth to the whole interior of a building (or portion of a building) from one point to multiple rooms. When combined with other systems in order to control the building climate, the whole system may be an HVAC (heating, ventilation and air conditioning) system.

Central heating differs from local heating in that the heat generation occurs in one place, such as a furnace room in a house or a mechanical room in a large building (though not necessarily at the «central» geometric point). The most common method of heat generation involves the combustion of fossil fuel in a furnace or boiler. The resultant heat then gets distributed: typically by forced-air through ductwork, by water circulating through pipes, or by steam fed through pipes. Increasingly, buildings utilize solar-powered heat sources, in which case the distribution system normally uses water circulation. Much of the temperate climate zone, most new housing has come with central heating installed since the Second World War, at least. Such areas normally use gas heaters, district heating, or oil-fired system, often using forced-air systems. Steam-heating systems, fired by coal, oil or gas, are also used, primarily for larger buildings. Electrical heating systems occur less commonly and are practical only with low-cost electricity or when ground source heat pumps are used. Considering the combined system of central generating plant and electric resistance heating, the overall efficiency will be less than for direct use of fossil fuel for space heating.

The Summer Palace of Peter the Great in St. Petersburg, one of the first buildings to incorporate the modern-type hydrologic central heating

Some buildings in the Roman Empire used central heating systems, conducting air heated by furnaces through empty spaces under the floors and out of pipes in the walls – a system known as a hypocaust.



In the early medieval Alpine upland, a simpler central heating system where heat travelled through underfloor channels from the furnace room replaced the Roman hypocaust at some places. In Reichenau Abbey a network of interconnected underfloor channels heated the 300 m² large assembly room of the monks during the winter months. The degree of efficiency of the system has been calculated at 90 %.

In the 13th century, the Cistercian monks revived central heating in Christian Europe using river diversions combined with indoor wood-fired furnaces. The well-preserved Royal Monastery of Our Lady of the Wheel (founded 1202) on the Ebro River in the Aragon region of Spain provides an excellent example of such an application.

The Roman hypocaust continued to be used on a smaller scale during late Antiquity and by the Umayyad caliphate, while later Muslim builder employed a simpler system of underfloor pipes.

By about 1700 Russian engineers had started designing hydrologically based systems for central heating. The Summer Palace (1710–1714) of Peter the Great in Saint Petersburg provides the best extant example. Slightly later, in 1716, came the first use of water in Sweden to distribute heat in buildings. Martin Triewald, a Swedish engineer, used this method for a greenhouse at Newcastle upon Tyne. Jean Simon Bonnemain (1743–1830), a French architect, introduced the technique to industry on a cooperative, at Château du Pécq, near Paris.

Angier March Perkins developed and installed some of the earliest steam-heating systems in the 1830s. The first was installed in the home of Governor of the Bank of England John Horley Palmer so that he could grow grapes in England's cold climate.

Franz San Galli, a Polish-born Russian businessman living in St. Petersburg, invented the radiator between 1855–1857, which was a major step in the final shaping of modern central heating.

Water heating

Common components of a central heating system using water-circulation include:

- Gas supply lines (sometimes including a propane tank), oil tank and supply lines or district heating supply lines
- Boiler (or a heat exchanger for district heating): heats water in a closed-water system
- Pump: circulates the water in the closed system
- Radiators: wall-mounted panels through which the heated water passes in order to release heat into rooms

Engineers in the United Kingdom and in other parts of Europe commonly combine the needs of room heating with hot-water heating and storage. These systems occur less commonly in the USA. In this case, the heated water in a sealed system flows through a heat exchanger in a hot-water tank or hot-water cylinder where it heats water from the normal water supply before that water gets fed to hot-water outlets in the house. These outlets may service hot-water taps or appliances such as washing machines or dishwashers.

Sealed water-circulating system



A sealed system provides a form of central heating in which the water used for heating usually circulates independently of the building's normal water supply. An expansion tank contains compressed gas, separated from the sealed-system water by a diaphragm. This allows for normal variations of pressure in the system. A safety valve allows water to escape from the system when pressure becomes too high, and a valve can open to replenish water from the normal water supply if the pressure drops too low. Sealed systems offer an alternative to open-vent systems, in which steam can escape from the

system, and gets replaced from the building's water supply via a feed and central storage system.

Electric and gas-fired heaters

Electric heating or resistance heating converts electricity directly to heat. Electric heat is often more expensive than heat produced by combustion appliances like natural gas, propane, and oil. Electric resistance heat can be provided by baseboard heaters, space heaters, radiant heaters, furnaces, wall heaters, or thermal storage systems.

Electric heaters are usually part of a fan coil which is part of a central air conditioner. They circulate heat by blowing air across the heating element which is supplied to the furnace through return air ducts. Blowers in electric furnaces move air over one to five resistance coils or elements which are usually rated at five kilowatts. The heating elements activate one at a time to avoid overloading the electrical system. Overheating is prevented by a safety switch called a limit controller or limit switch. This limit controller may shut the furnace off if the blower fails or if something is blocking the air flow. The heated air is then sent back through the home through supply ducts.

In larger commercial applications, central heating is provided through an air handler which incorporates similar components as a furnace but on a larger scale.

Hydronic and steam systems

Hydronic heating systems are systems that circulate a medium for heating. Hydronic radiant floor heating systems use a boiler or district heating to heat water and a pump to circulate the hot water in plastic pipes installed in a concrete slab. The pipes, embedded in the floor, carry heated water that conducts warmth to the surface of the floor, where it broadcasts heat energy to the room above.

Hydronic systems circulate hot water for heating. Steam heating systems are similar to heating water systems, except that steam is used as the heating medium instead of water.

Hydronic heating systems generally consist of a boiler or district heating heat exchanger, hot water circulating pumps, distribution piping, and a fan coil unit or a radiator located in the room or space. Steam heating systems are similar, except that no circulating pumps are required.

Hydronic systems are closed loop: the same fluid is heated and then reheated. Hydronic heating systems are also used with antifreeze solutions in ice and snow melt systems for walkways, parking lots and streets. They are more commonly used in commercial and whole house radiant floor heat projects, whereas electric radiant heat systems are more commonly used in smaller «spot warming» applications.

Heat pumps

In mild climates a heat pump can be used to air condition the building during hot weather, and to warm the building using heat extracted from outdoor air in cold weather. Air-source heat pumps are generally uneconomic for outdoor temperatures much below freezing. In colder climates, geothermal heat pumps can be used to extract heat from the ground. For economy, these systems are designed for average low winter temperatures and use supplemental heating for extreme low temperature conditions. The advantage of the heat pump is that it reduces the purchased energy required for building heating; often geothermal source systems also supply domestic hot water. Even in places where fossil fuels provide most electricity, a geothermal system may offset greenhouse gas production since most of the energy furnished for heating is supplied from the environment, with only 15–30 % purchased.

Environmental aspects

From an energy-efficiency standpoint considerable heat gets lost or goes to waste if only a single room needs heating, since central heating has distribution losses and (in the case of forced-air systems particularly) may heat some unoccupied rooms without need. In such buildings which require isolated heating, one may wish to consider non-central systems such as individual room heaters, fireplaces or other devices. Alternatively, architects can design new buildings which can virtually eliminate the need for heating, such as those built to the Passive House standard.

However, if a building does need full heating, combustion central heating offers a more environmentally friendly solution than electric-air central heating or than other direct electric heating devices. This stems from the fact that most electricity originates remotely using fossil fuels, with up to two-thirds of the energy in the fuel lost (unless utilized for district heating) at the power station and in transmission losses. In Sweden proposals exist to phase out direct electric heating for this reason (see oil phase-out in Sweden). Nuclear and hydroelectric sources reduce this factor.

In contrast, hot-water central heating systems can use water heated in or close to the building using high-efficiency condensing boilers, biofuels, or district heating. Wet underfloor heating has proven ideal. This offers the option of relatively easy conversion in the future to use developing technologies such as heat pumps and solar combisystems, thereby also providing future-proofing.

Typical efficiencies for central heating are: 85-97 % for gas fired heating; 80-89 % for oil-fired, and 45-60 % for coal-fired heating.

TEXT 2

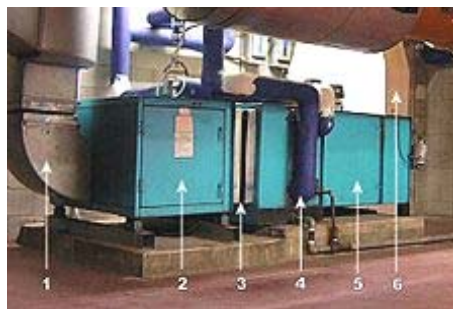
Задание 1. Прочитайте текст, стараясь понять его общее содержание.

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Ventilation architecture

An air handling unit is used for the heating and cooling of air in a central location (click on image for legend).

Ventilating (the V in HVAC) is the process of «changing» or replacing air in any space to provide high indoor air quality (i.e. to control temperature, replenish oxygen, or remove moisture, odors, smoke, heat, dust, airborne bacteria, and carbon dioxide). Ventilation is used to remove unpleasant smells and excessive moisture, introduce outside air, to keep interior building air circulating, and to prevent stagnation of the interior air.



Ventilation includes both the exchange of air to the outside as well as circulation of air within the building. It is one of the most important factors for maintaining acceptable indoor air quality in buildings. Methods for ventilating a building may be divided into mechanical/forced and natural types.

«Mechanical» or «forced» ventilation is used to control indoor air quality. Excess humidity, odors, and contaminants can often be controlled via dilution or replacement with outside air. However, in humid climates much energy is required to remove excess moisture from ventilation air.

Kitchens and bathrooms typically have mechanical exhaust to control odors and sometimes humidity. Kitchens have additional problems to deal with such as smoke and grease (see kitchen ventilation). Factors in the design of such systems include the flow rate (which is a function of the fan speed and exhaust vent size) and noise level. If ducting for the fans traverse unheated space (e.g., an attic), the ducting should be insulated as well to prevent condensation on the ducting. Direct drive fans are available for many applications, and can reduce maintenance needs.

Natural ventilation is the ventilation of a building with outside air without the use of a fan or other mechanical system. It can be achieved with openable windows or trickle vents when the spaces to ventilate are small and the architecture permits. In more complex systems warm air in the building can be allowed to rise and flow out upper openings to the outside (stack effect) thus forcing cool outside air to be drawn into the building naturally through openings in the lower areas. These systems use very little energy but care must be taken to ensure the occupants' comfort. In warm or humid months, in many climates,

maintaining thermal comfort solely via natural ventilation may not be possible so conventional air conditioning systems are used as backups. Air-side economizers perform the same function as natural ventilation, but use mechanical systems' fans, ducts, dampers, and control systems to introduce and distribute cool outdoor air when appropriate.

Definition

Ventilation is the intentional movement of air from outside a building to the inside. Ventilation air, as defined in ASHRAE Standard 62.1[2] and the ASHRAE Handbook, [3] is that air used for providing acceptable indoor air quality. It mustn't be confused with *vents* or *flues*; which mean the exhausts of clothes dryers and combustion equipment such as water heaters, boilers, fireplaces, and wood stoves. The vents or flues carry the products of combustion which have to be expelled from the building in a way which does not cause harm to the occupants of the building. Movement of air between indoor spaces, and not the outside, is called transfer air.

Ventilation

In commercial, industrial, and institutional (CII) buildings, and modern jet aircraft, return air is often recirculated to the air handling unit. A portion of the supply air is normally exfiltrated through the building envelope or exhausted from the building (e.g., bathroom or kitchen exhaust) and is replaced by outside air introduced into the return air stream. The rate of ventilation air required, most often provided by this mechanically-induced outside air, is often determined from *ASHRAE Standard 62.1* for CII buildings, or *62.2* for low-rise residential buildings, or similar standards.

Necessity

When people or animals are present in buildings, ventilation air is necessary to dilute odors and limit the concentration of carbon dioxide and airborne pollutants such as dust, smoke and volatile organic compounds (VOCs). Ventilation air is often delivered to spaces by mechanical systems which may also heat, cool, humidify and dehumidify the space. Air movement into buildings can occur due to uncontrolled infiltration of outside air through the building fabric (see stack effect) or the use of deliberate natural ventilation strategies. Advanced air filtration and treatment processes such as *scrubbing*, can provide ventilation air by cleaning and recirculating a proportion of the air inside a building.

Types of ventilation

- Mechanical or forced ventilation: through an air handling unit or direct injection to a space by a fan. A local exhaust fan can enhance infiltration or natural ventilation, thus increasing the ventilation air flow rate.

- Natural ventilation occurs when the air in a space is changed with outdoor air without the use of mechanical systems, such as a fan. Most often natural ventilation is assured through operable windows but it can also be achieved through temperature and pressure differences between spaces. Open windows or vents are not a good choice for ventilating a basement or other below ground structure. Allowing outside air into a cooler below ground space will cause problems with humidity and condensation.

- Mixed Mode Ventilation or Hybrid ventilation: utilises both mechanical and natural ventilation processes. The mechanical and natural components may be used in conjunction with each other or separately at different times of day. The natural component, sometimes subject to unpredictable external weather conditions may not always be adequate to ventilate the desired space. The mechanical component is then used to increase the overall ventilation rate so that the desired internal conditions are met. Alternatively the mechanical component may be used as a control measure to regulate the natural ventilation process, for example, to restrict the air change rate during periods of high wind speeds.

- Infiltration is separate from *ventilation*, but is often used to provide *ventilation air*.

Ventilation rate

The ventilation rate, for CII buildings, is normally expressed by the volumetric flow rate of outside air being introduced to the building. The typical units used are cubic feet per minute (CFM) or liters per second (L/s). The ventilation rate can also be expressed on a per person or per unit floor area basis, such as CFM/p or CFM/ftI, or as air changes per hour.

For residential buildings, which mostly rely on infiltration for meeting their ventilation needs, the common ventilation rate measure is the number of times the whole interior volume of air is replaced per hour, and is called air changes per hour (*I* or *ACH*; units of 1/h). During the winter, ACH may range from 0.50 to 0.41 in a tightly insulated house to 1.11 to 1.47 in a loosely insulated house.

ASHRAE now recommends ventilation rates dependent upon floor area, as a revision to the 62-2001 standard whereas the minimum ACH was 0.35, but no less than 15 CFM/person (7.1 L/s/person). As of 2003, the standards have changed to an addition of 3 CFM/100 sq. ft. (15 l/s/100 sq. m.) to the 7.5 CFM/person (3.5 L/s/person) standard.

Ventilation standards

- In 1973, in response to the 1973 oil crisis and conservation concerns, ASHRAE Standards 62-73 and 62-81 reduced required ventilation from 10 CFM (4.76 L/S) per person to 5 CFM (2.37 L/S) per person. This was found to be a primary cause of sick building syndrome.

- Current ASHRAE standards (Standard 62-89) states that appropriate ventilation guidelines are 20 CFM (9.2 L/s) per person in an office building, and 15 CFM (7.1 L/s) per person for schools. In commercial environments with tobacco smoke, the ventilation rate may range from 25 CFM to 125 CFM.

In certain applications, such as submarines, pressurized aircraft, and spacecraft, ventilation air is also needed to provide oxygen, and to dilute carbon dioxide for survival. Batteries in submarines also discharge hydrogen gas, which must also be ventilated for health and safety. In any pressurized, regulated environment, ventilation is necessary to control any fires that may occur, as the flames may be deprived of oxygen.

Ventilation guidelines are based upon the minimum ventilation rate required to maintain acceptable levels of bioeffluents. Carbon dioxide is used as a reference point, as it is the gas of highest emission at a relatively constant value of 0.005 L/s. The mass balance equation is:

$$Q = G / (C_i - C_a)$$

- Q = ventilation rate (L/s)
- G = CO₂ generation rate
- C_i = acceptable indoor CO₂ concentration
- C_a = ambient CO₂ concentration

Natural ventilation

Natural ventilation involves harnessing naturally available forces to supply and remove air in an enclosed space. There are three types of natural ventilation occurring in buildings: wind driven ventilation, pressure-driven flows, and stack ventilation. The pressures generated by 'the stack effect' rely upon the buoyancy of heated or rising air. Wind driven ventilation relies upon the force of the prevailing wind to pull and push air through the enclosed space as well as through breaches in the building's envelope (see Infiltration (HVAC)).

Almost all historic buildings were ventilated naturally. The technique was generally abandoned in larger US buildings during the late 20th century as the use of air conditioning became more widespread. However, with the advent of advanced Building Energy Modeling (BEM) software, improved Building Automation Systems (BAS), Leadership in Energy and Environmental Design (LEED) design requirements, and improved window manufacturing techniques; natural ventilation has made a resurgence in commercial buildings both globally and throughout the US.

The benefits of natural ventilation include:

- Improved Indoor air quality (IAQ)
- Energy savings
- Reduction of greenhouse gas emissions
- Occupant control
- Reduction in occupant illness associated with Sick Building Syndrome
- Increased worker productivity

Demand-controlled ventilation (DCV)

DCV makes it possible to maintain proper ventilation and improve air quality while saving energy. ASHRAE has determined that: «It is consistent with the Ventilation rate procedure that Demand Control be permitted for use to reduce the total outdoor air supply during periods of less occupancy». CO₂ sensors will control the amount of ventilation for the actual number of occupants. During design occupancy, a unit with the DCV system will deliver the same amount of outdoor air as a unit using the ventilation-rate procedure. However, DCV can generate substantial energy savings whenever the space is occupied below the design level.

Local exhaust ventilation

Local exhaust ventilation addresses the issue of avoiding the contamination of indoor air by specific high-emission sources by capturing airborne contaminants before they are spread into the environment. This can include water vapor control, lavatory bioeffluent control, solvent vapors from industrial processes, and dust from wood- and metal-working machinery. Air can be exhausted through pressurized hoods or through the use of fans and pressurizing a specific area. A local exhaust system is composed of 5 basic parts

1. A hood that captures the contaminant at its source
2. Ducts for transporting the air
3. An air-cleaning device that removes/minimizes the contaminant
4. A fan that moves the air through the system
5. An exhaust stack through which the contaminated air is discharged.

In the UK, the use of LEV systems have regulations set out by the Health and Safety Executive (HSE) which are referred to as the Control of Substances Hazardous to Health (CoSHH). Under CoSHH, legislation is set out to protect users of LEV systems by ensuring that all equipment is tested at least every fourteen months to ensure the LEV systems are performing adequately. All parts of the system must be visually inspected and thoroughly tested and where any parts are found to be defective the inspector must issue a red label to identify the defective part and the issue.

The owner of the LEV system must then have the defective parts repaired or replaced before the system can be used.

Ventilation and combustion

Combustion (e.g., fireplace, gas heater, candle, oil lamp, etc.) consumes oxygen while producing carbon dioxide and other unhealthy gases and smoke, requiring ventilation air. An open chimney promotes infiltration (i.e. natural ventilation) because of the negative pressure change induced by the buoyant, warmer air leaving through the chimney. The warm air is typically replaced by heavier, cold air.

Ventilation in a structure is also needed for removing water vapor produced by respiration, burning, and cooking, and for removing odors. If water vapor is permitted to accumulate, it may damage the structure, insulation, or finishes. When operating, an air conditioner usually removes excess moisture from the air. A dehumidifier may also be appropriate for removing airborne moisture.

Problems

In hot, humid climates, unconditioned ventilation air will deliver approximately one pound of water each day for each cfm of outdoor air per day, annual average. This is a great deal of moisture, and it can create serious indoor moisture and mold problems.

- Ventilation efficiency is determined by design and layout, and is dependent upon placement and proximity of diffusers and return air outlets. If they are located closely together, supply air may mix with stale air, decreasing efficiency of the HVAC system, and creating air quality problems.
- System imbalances occur when components of the HVAC system are improperly adjusted or installed, and can create pressure differences (too much circulating air creating a draft or too little circulating air creating stagnancy).
- Cross-contamination occurs when pressure differences arise, forcing potentially contaminated air from one zone to an uncontaminated zone. This often involves undesired odors or VOCs.
- Re-entry of exhaust air occurs when exhaust outlets and fresh air intakes are either too close, or prevailing winds change exhaust patterns, or by infiltration between intake and exhaust air flows.
- Entrainment of contaminated outside air through intake flows will result in indoor air contamination. There are a variety of contaminated air sources, ranging from industrial effluent to VOCs put off by nearby construction work.

Air Quality Procedures

Ventilation Rate Procedure is rate based on standard, and «prescribes the rate at which ventilation air must be delivered to a space and various means to condition that air». Air quality is assessed (through CO₂ measurement) and ventilation rates are mathematically derived using constants.

Indoor Air Quality Procedure “uses one or more guidelines for the specification of acceptable concentrations of certain contaminants in indoor air but does not prescribe ventilation rates or air treatment methods.” This addresses both quantitative and subjective evaluation, and is based on the Ventilation Rate Procedure. It also accounts for potential contaminants that may have no measured limits, or limits are not set (such as formaldehyde offgassing from carpet and furniture).

ТЕХТ 3

Задание 1. Прочитайте текст, стараясь понять его общее содержание.

Задание 2. Выполните полный письменный перевод текста. Объясните, какие переводческие трансформации вы используете.

Construction

Many successful small businesses eventually decide to expand their operations by either purchasing, leasing, or building a new facility. In some instances, the business in question relocates its entire operation in the new facility. In other cases, the business may use the new facility to house excess inventory, maintain equipment, relieve office overcrowding, or open a new store.

For those companies that decide to expand via new construction, the experience can be an unsettling one, full of uncertainties. In fact, relatively few startup businesses choose construction as their mode of entry due to the higher costs associated with it and the greater length of time involved from the breaking ground stage to the day when the establishment opens its doors for business. Small- and mid-sized businesses, however, are far more likely to have the financial wherewithal to launch a new construction project. Such firms have a proven track record – which can help them with financing – and already-productive operations that bring in revenue that can be used to defray the costs of construction.

Owners of these businesses, however, should fully weigh the advantages and disadvantages of construction before moving forward. As the J.K. Lasser Institute indicated in *How to Run a Small Business*, «Building has the advantage of giving you the space and arrangements which meet your needs, providing you know specifically and objectively what the needs are. The obvious disadvantages are the delay in occupancy while land acquisition, design work, and building are going on, and the cost of overruns and mistakes caused by forecasting errors and planning oversights».

Certainly, there are risks associated with construction. But for small- and mid-sized business owners that choose this method of expansion and/or growth – and plan wisely both before, during, and after the construction phase – it can also mark the beginning of a bright new chapter in the company's history. As Dave Pelland stated in *Risk Management*, «Constructing or renovating a corporate facility can mark an important crossroads in the development of a growing company. Constructed properly, the new facility can allow the company to generate additional revenue, reduce expenses, or increase efficiency».

Securing a Building Contractor

Some sources of potential building contractors include professional association databases, referrals from architects or fellow small business owners, and a competitive bidding process. «It is important to find a contractor that can build in your specific industry, whether it's a restaurant, health care facility, industrial plant, or technology center», Amanda Strickland wrote in the *Dallas Business Journal*. «Contractors tend to have niches».

Pelland noted that small business owners seeking to secure a good building contractor should concentrate on three factors:

- The contractor's reputation in the community.
- The financial condition of the contractor.
- The status of currently uncompleted jobs by the contractor.

Warning signs can take many forms when examining the above issues. Is the contractor known for subcontracting out large percentages of the total construction work? Does the contractor have a history of clashes with subcontractors? How long has the contractor done business in the area? What percentage of jobs does he complete on schedule? Does his previous work experience adequately match the sort of renovation or construction that your company needs? Does the contractor have a backlog of projects that could hurt his ability to match your timetable? What sort of references can he provide? The answers to all of these questions can be either reassuring or cause for further investigation. In either case, the key is to make sure that you ask them.

Pelland and other analysts note that one way in which small business owners can learn the answers to some of these questions is by requiring bidding contractors to submit a surety bond, which is basically a three-party contract between the contractor, the project owner, and the underwriting surety company. Surety companies, noted Pelland, will make an extensive review of the construction company before issuing such a bond. In addition, if the contractor signs the bond, he is basically guaranteeing his ability to complete the project on which he is bidding.

Monitoring the Construction Process

«After the bidding process is completed» said Pelland, «the successful contractor should be asked to provide a performance bond, which guarantees that the project's contractual provisions will be carried out, and a payment bond, which certifies that suppliers and subcontractors will be paid». Ensuring that the contractor and all of his subcontractors have adequate insurance (workers' compensation, general and umbrella liability, equipment, builders' risk, etc.) to address problems is another key to attaining piece of mind for the small business owner. Finally, the project owner needs to make sure that he or she continuously monitors the performance of the contractor.

Construction

In the fields of architecture and civil engineering, **construction** is a process that consists of the building or assembling of infrastructure. Far from being a single activity, large scale construction is a feat of human multitasking. Normally, the job is managed by a project manager, and supervised by a construction manager, design engineer, construction engineer or project architect.

For the successful execution of a project, effective planning is essential. Involved with the design and execution of the infrastructure in question must consider the environmental impact of the job, the successful scheduling, budgeting, construction site safety, availability of building materials, logistics, inconvenience to the public caused by construction delays and bidding, etc.

In general, there are four types of construction:

1. Residential Building construction
2. Industrial construction
3. Commercial Building construction
4. Heavy Civil construction

Each type of construction project requires a unique team to plan, design, construct and maintain the project.

Building construction

Building construction is the process of adding structure to real property. The vast majority of building construction jobs are small renovations, such as addition of a room, or renovation of a bathroom. Often, the owner of the property acts as laborer, paymaster, and design team for the entire project. However, all building construction projects include some elements in common – design, financial, estimating and legal considerations. Many projects of varying sizes reach undesirable end results, such as structural collapse, cost overruns, and/or litigation reason, those with experience in the field make detailed plans and maintain careful oversight during the project to ensure a positive outcome.

Commercial building construction is procured privately or publicly utilizing various delivery methodologies, including cost estimating, hard bid, negotiated price, traditional, management contracting, construction management-at-risk, design & build and design-build bridging.

Residential construction practices, technologies, and resources must conform to local building authority regulations and codes of practice. Materials readily available in the area generally dictate the construction materials used (e.g. brick versus stone, versus timber). Cost of construction on a per square meter (or per square foot) basis for houses can vary dramatically based on site conditions, local regulations, economies of scale (custom designed homes are always more expensive to build) and the availability of skilled tradespeople. As

residential construction (as well as all other types of construction) can generate a lot of waste, careful planning again is needed here.

The most popular method of residential construction in the United States is wood framed construction. As efficiency codes have come into effect in recent years, new construction technologies and methods have emerged. University Construction Management departments are on the cutting edge of the newest methods of construction intended to improve efficiency, performance and reduce construction waste.

New techniques of building construction are being researched, made possible by advances in 3D printing technology. In a form of *additive building construction*, similar to the additive manufacturing techniques for manufactured parts, building printing is making it possible to flexibly construct small commercial buildings and private habitations in around 20 hours, with built-in plumbing and electrical facilities, in one continuous build, using large 3D printers. Working versions of 3D-printing building technology are already printing 2 metres (6 ft 7 in) of building material per hour as of January 2013, with the next-generation printers capable of 3.5 metres (11 ft) per hour, sufficient to complete a building in a week. Dutch architect Janjaap Ruijsenaars's performative architecture 3D-printed building is scheduled to be built in 2014.

Construction processes

Design team

In the modern industrialized world, construction usually involves the translation of designs into reality. A formal design team may be assembled to plan the physical proceedings, and to integrate those proceedings with the other parts. The design usually consists of drawings and specifications, usually prepared by a design team including surveyors, civil engineers, cost engineers (or quantity surveyors), mechanical engineers, electrical engineers, structural engineers, fire protection engineers, planning consultants, architectural consultants, and archaeological consultants. The design team is most commonly employed by (i.e. in contract with) the property owner. Under this system, once the design is completed by the design team, a number of construction companies or construction management companies may then be asked to make a bid for the work, either based directly on the design, or on the basis of drawings and a bill of quantities provided by a quantity surveyor. Following evaluation of bids, the owner will typically award a contract to the most cost efficient bidder.

The modern trend in design is toward integration of previously separated specialties, especially among large firms. In the past, architects, interior designers, engineers, developers, construction managers, and general contractors were more likely to be entirely separate companies, even in the larger firms. Presently, a firm that is nominally an «architecture» or «construction

management» firm may have experts from all related fields as employees, or to have an associated company that provides each necessary skill. Thus, each such firm may offer itself as «one-stop shopping» for a construction project, from beginning to end. This is designated as a «design Build» contract where the contractor is given a performance specification and must undertake the project from design to construction, while adhering to the performance specifications.

Several project structures can assist the owner in this integration, including design-build, partnering and construction management. In general, each of these project structures allows the owner to integrate the services of architects, interior designers, engineers and constructors throughout design and construction. In response, many companies are growing beyond traditional offerings of design or construction services alone and are placing more emphasis on establishing relationships with other necessary participants through the design-build process.

The increasing complexity of construction projects creates the need for design professionals trained in all phases of the project's life-cycle and develop an appreciation of the building as an advanced technological system requiring close integration of many sub-systems and their individual components, including sustainability. **Building engineering** is an emerging discipline that attempts to meet this new challenge.

Financial advisors

Construction projects can suffer from preventable financial problems. **Underbids** ask for too little money to complete the project. Cash flow problems exist when the present amount of funding cannot cover the current costs for labour and materials, and because they are a matter of having sufficient funds at a specific time, can arise even when the overall total is enough. Fraud is a problem in many fields, but is notoriously prevalent in the construction field. Financial planning for the project is intended to ensure that a solid plan with adequate safeguards and contingency plans are in place before the project is started and is required to ensure that the plan is properly executed over the life of the project.

Mortgage bankers, accountants, and cost engineers are likely participants in creating an overall plan for the financial management of the building construction project. The presence of the mortgage banker is highly likely, even in relatively small projects since the owner's equity in the property is the most obvious source of funding for a building project. Accountants act to study the expected monetary flow over the life of the project and to monitor the payouts throughout the process. Cost engineers and estimators apply expertise to relate the work and materials involved to a proper valuation. Cost overruns with government projects have occurred when the contractor was able to identify change orders or changes in the project resulting in large increases in cost,

which are not subject to competition by other firm as they have already been eliminated from consideration after the initial bid.

Large projects can involve highly complex financial plans and often start with a conceptual estimate performed by a building estimator. As portions of a project are completed, they may be sold, supplanting one lender or owner for another, while the logistical requirements of having the right trades and materials available for each stage of the building construction project carries forward. In many English-speaking countries, but not the United States, projects typically use quantity surveyors.

Legal aspects

A construction project must fit into the legal framework governing the property. These include governmental regulations on the use of property, and obligations that are created in the process of construction.

The project must adhere to zoning and building code requirements. Constructing a project that fails to adhere to codes will not benefit the owner. Some legal requirements come from *malum in se* considerations, or the desire to prevent things that are indisputably bad – bridge collapses or explosions. Other legal requirements come from *malum prohibitum* considerations, or things that are a matter of custom or expectation, such as isolating businesses to a business district and residences to a residential district. An attorney may seek changes or exemptions in the law governing the land where the building will be built, either by arguing that a rule is inapplicable (the bridge design will not collapse), or that the custom is no longer needed (acceptance of live-work spaces has grown in the community).

A construction project is a complex net of contracts and other legal obligations, each of which must be carefully considered. A contract is the exchange of a set of obligations between two or more parties, but it is not so simple a matter as trying to get the other side to agree to as much as possible in exchange for as little as possible. The time element in construction means that a delay costs money, and in cases of bottlenecks, the delay can be extremely expensive. Thus, the contracts must be designed to ensure that each side is capable of performing the obligations set out. Contracts that set out clear expectations and clear paths to accomplishing those expectations are far more likely to result in the project flowing smoothly, whereas poorly drafted contracts lead to confusion and collapse.

Legal advisors in the beginning of a construction project seek to identify ambiguities and other potential sources of trouble in the contract structure, and to present options for preventing problems. Throughout the process of the project, they work to avoid and resolve conflicts that arise. In each case, the lawyer facilitates an exchange of obligations that matches the reality of the project.

Interaction of expertise

Design, finance, and legal aspects overlap and interrelate. The design must be not only structurally sound and appropriate for the use and location, but must also be financially possible to build, and legal to use. The financial structure must accommodate the need for building the design provided, and must pay amounts that are legally owed. The legal structure must integrate the design into the surrounding legal framework, and enforce the financial consequences of the construction process.

Procurement

Procurement describes the merging of activities undertaken by the client to obtain a building. There are many different methods of construction procurement; however the three most common types of procurement are:

1. Traditional (Design-bid-build)
2. Design and build
3. Management contracting

There is also a growing number of new forms of procurement that involve relationship contracting where the emphasis is on a co-operative relationship between the principal and contractor and other stakeholders within a construction project. New forms include partnering such as Public-Private Partnering (PPPs) aka private finance initiatives (PFIs) and alliances such as «pure» or «project» alliances and «impure» or «strategic» alliances. The focus on co-operation is to ameliorate the many problems that arise from the often highly competitive and adversarial practices within the construction industry.

Traditional

Main article: Design – bid – build

This is the most common method of construction procurement and is well established and recognized. In this arrangement, the architect or engineer acts as the project coordinator. His or her role is to design the works, prepare the specifications and produce construction drawings, administer the contract, tender the works, and manage the works from inception to completion. There are direct contractual links between the architect's client and the main contractor. Any subcontractor will have a direct contractual relationship with the main contractor.

Design and build

This approach has become more common in recent years and involves the client contracting a single entity to both provide a design and to build that design. In some cases, the Design and Build (D & B) package can also include finding the site, arranging funding and applying for all necessary statutory consents.

The owner produces a list of requirements for a project, giving an overall view of the project's goals. Several D&B contractors present different ideas about how to accomplish these goals. The owner selects the ideas he or she likes best and hires the appropriate contractor. Often, it is not just one contractor, but a consortium of several contractors working together. Once a contractor (or a consortium/consortia) has been hired, they begin building the first phase of the project. As they build phase 1, they design phase 2. This is in contrast to a design-bid-build contract, where the project is completely designed by the owner, then bid on, then completed.

Kent Hansen pointed out that state departments of transportation (DOTs) usually use design build contracts as a way of getting projects done when states don't have the resources. In DOTs, design build contracts are usually used for very large projects.

Management procurement systems

Main article: Construction management

In this arrangement the client plays an active role in the procurement system by entering into separate contracts with the designer (architect or engineer), the construction manager, and individual trade contractors. The client takes on the contractual role, while the construction or project manager provides the active role of managing the separate trade contracts, and ensuring that they all work smoothly and effectively together.

Management procurement systems are often used to speed up the procurement processes, allow the client greater flexibility in design variation throughout the contract, the ability to appoint individual work contractors, separate contractual responsibility on each individual throughout the contract, and to provide greater client control.

Authority having jurisdiction

In construction, the **authority having jurisdiction** (AHJ) is the governmental agency or sub-agency which regulates the construction process. In most cases, this is the municipality in which the building is located. However, construction performed for supra-municipal authorities are usually regulated directly by the owning authority, which becomes the AHJ.

Before the foundation can be dug, contractors are typically required to verify and have existing utility lines marked, either by the utilities themselves or through a company specializing in such services. This lessens the likelihood of damage to the existing electrical, water, sewage, phone, and cable facilities, which could cause outages and potentially hazardous situations. During the construction of a building, the municipal building inspector inspects the building periodically to ensure that the construction adheres to the approved plans and the

local **building code**. Once construction is complete and a final inspection has been passed, an **occupancy permit** may be issued.

An operating building must remain in compliance with the **fire code**. The fire code is enforced by the local fire department.

Changes made to a building that affect safety, including its use, expansion, structural integrity, and fire protection items, usually require approval of the AHJ for review concerning the building code.

Construction careers

There are many routes to the different careers within the construction industry which vary by country. However, there are three main tiers of careers based on educational background which are common internationally:

- Unskilled and semi-skilled – General site labor with little or no construction qualifications.
- Skilled – On-site managers who possess extensive knowledge and experience in their craft or profession.
- Technical and management – Personnel with the greatest educational qualifications, usually graduate degrees, trained to design, manage and instruct the construction process.

Skilled occupations in the UK require further education qualifications, often in vocational subject areas. These qualifications are either obtained directly after the completion of compulsory education or through «on the job» apprenticeship training. In the UK, 8500 construction-related apprenticeships were commenced in 2007.

Technical and specialized occupations require more training as a greater technical knowledge is required. These professions also hold more legal responsibility. A short list of the main careers with an outline of the educational requirements are given below:

- Quantity surveyor – Typically holds a master's degree in quantity surveying. Chartered status is gained from the Royal Institution of Chartered Surveyors.
- Architect – Typically holds 1, undergraduate 3 year degree in architecture + 1, post-graduate 2 year degree (DipArch or BArch) in architecture plus 24 months experience within the industry. To use the title «architect» the individual must be registered on the Architects Registration Board register of Architects.
- Civil engineer – Typically holds a degree in a related subject. The Chartered Engineer qualification is controlled by the Engineering Council, and is often achieved through membership of the Institution of Civil Engineers. A new university graduate must hold a master's degree to become chartered, persons with bachelor's degrees may become an Incorporated Engineer.
- Building services engineer – Often referred to as an «M&E Engineer» typically holds a degree in mechanical or electrical engineering. Chartered

Engineer status is governed by the Engineering Council, mainly through the Chartered Institution of Building Services Engineers.

- Project manager – Typically holds a 4-year or greater higher education qualification, but are often also qualified in another field such as quantity surveying or civil engineering.

- Structural engineer – Typically holds a bachelors or master's degree in structural engineering. A P.ENG is required from the Professional Engineers Ontario. (ON, CANADA) New university graduates must hold a master's degree to gain chartered status from the Engineering Council, mainly through the Institution of Structural Engineers (UK).

- Civil Estimators are professionals who typically have a background in civil engineering, construction project management, or construction supervision.

In 2010 a salary survey revealed the differences in remuneration between different roles, sectors and locations in the construction and built environment industry. The results showed that areas of particularly strong growth in the construction industry, such as the Middle East, yield higher average salaries than in the UK for example. The average earning for a professional in the construction industry in the Middle East, across all sectors, job types and levels of experience, is £42, 090, compared to £26, 719 in the UK. This trend is not necessarily due to the fact that more affluent roles are available however as architects with 14 or more years experience working in the Middle East earns on average £43, 389 per annum, compared to £40, 000 in the UK. Some construction workers in the US/CANADA have made more than \$100, 000 annually, depending on their trade.

Safety

Construction is one of the most dangerous occupations in the world, incurring more occupational fatalities than any other sector in both the United States and in the European Union. In 2009, the fatal occupational injury rate among construction workers in the United States was nearly three times that for all workers. Falls are one of the most common causes of fatal and non-fatal injuries among construction workers. Proper safety equipment such as harnesses and guardrails and procedures such as securing ladders and inspecting scaffolding can curtail the risk of occupational injuries in the construction industry.

History

Main article: History of construction

See also: History of architecture

The first huts and shelters were constructed by hand or with simple tools. As cities grew during the Bronze Age, a class of professional craftsmen, like bricklayers and carpenters, appeared. Occasionally, slaves were used for

construction work. In the Middle Ages, these were organized into guilds. In the 19th century, steam-powered machinery appeared, and later diesel- and electric powered vehicles such as cranes, excavators and bulldozers. Architecture and construction involves creating awesome structures that can show the beauty and creativity of the human intellect.

TEXT 4

Задание 1. Прочитайте текст, стараясь понять его общее содержание.

Задание 2. Выполните полный письменный перевод текста. Объясните, какие переводческие трансформации вы используете.

Native American and Colonial Housing

HOUSING Native Americans built a wide variety of houses on the North American continent thousands of years before European colonization. Some were simple triangular tipis, engineered to resist the wind and keep out the cold but easily moveable; others were earthen, wood and covering, stone, or adobe houses. Often the shapes of these dwellings reflected the features of the land around them as their builders sought a safe accommodation with nature. Native Americans lived in single-family structures, extended-family structures, and multiunit structures. In the mid-sixteenth century Spaniards explored the Southwest, where they found Native Americans living in remarkable cliff dwellings and pueblos. The Europeans added their own concepts of housing to indigenous materials and methods of construction to create a distinctive style still common in the Southwest. European colonists arriving on the eastern seaboard in the seventeenth century built houses of masonry or wood that imitated Old World houses. The few remaining from the colonial period are readily identifiable as Dutch, French, or English. In forested New England, colonial houses were built of wood. In Virginia and Maryland the colonists built masonry houses, using the clay soil to make bricks and oyster shells to make mortar. The earliest colonial houses were simple one-or two-room, one-story buildings.

During the colonial period there emerged several types of American houses that incorporated distinctive environmental adaptations. New England houses were designed for difficult winters with sharply sloped roofs, low ceilings, small rooms, and small windows. The houses of the Southwest faced inward onto courtyards, had thick adobe walls, high ceilings, and small windows in outer facades. The houses of the Middle Atlantic states and the South were built with high ceilings, large windows, central halls, and long porches. Houses were placed on hills to capture breezes or sheltered to avoid harsh winds. Not until central heating and air conditioning did such adaptations to climate become less crucial.

Settlement of the West and the Urbanization of America

Nineteenth-century settlers beyond the Appalachians at first built modest houses that utilized the resources available to them. Those in woodland areas built log cabins. Faced with treeless prairies, the immigrants who settled the Great Plains in the second half of the nineteenth century built dugouts or sod houses and sometimes houses of stone. However, when the railroads brought cut lumber and other building supplies, wood-framed houses in styles popular on the east coast became typical in the interior portions of the country.

In 1860 four times as many people lived in rural as in urban areas, but by 1920 rural and urban populations were approaching parity. Industry transformed America between the Civil War and the early twentieth century from a rural agricultural nation to one in which cities were growing rapidly as people came to them from both foreign countries and rural areas. The Census of 1890 counted some 12.7 million families in the United States. That number was 11 percent more than the number of dwelling units, with an even worse housing ratio in the eastern industrialized cities. For example, in 1900 three-quarters of New York City's population lived in squalid, overcrowded tenements. In 1890 Jacob Riis published *How the Other Half Lives*, a shocking description of slum life among New York City immigrants.

On the other hand, the houses of the more prosperous were being equipped with electric lights, central heating, and indoor bathrooms by the 1880s. New forms of public transportation, primarily electric streetcars, made possible the development of housing away from city centers. A nationwide speculation boom in land acquisition and subdivision of building lots developed in the 1880s, and by the end of 1892, the housing market in the United States was oversupplied.

At the end of the nineteenth century, the new American industrialists began displaying their wealth by building showplace houses in cities and more rural settings. Newport, Rhode Island, was a favorite location for the fabulous summer homes of the wealthy. The elegance and luxury of this housing stood in sharp contrast to city tenements and the shacks of the poor in the South.

Frank Lloyd Wright and Suburbanization

Before World War I, a comprehensive movement of social and political reform known as progressivism took a stand against the ostentatious lifestyles of the wealthy and condemned the wretchedness of slum housing. Frank Lloyd Wright envisioned the ideal suburban house for the independent American family, a free-standing house on its own plot of ground. Wright proposed that American housing development be spread over the entire country with each family occupying one house on one acre of land. A vast network of roads could link it all together in a culture without cities. It is this pattern of sprawl, so

sharply in contrast to the centralized settlements brought to the United States from Europe, that has come to prevail in the United States.

Wright's Prairie Houses incorporated a new form of interior design that featured large fireplaces in the center of the house and an open flowing floor plan. The symbolism of the houses was sanctuary for the American family, natural surroundings, escape from the crowded conditions of the city, and rejection of the artificiality of overwrought design. Wright's designs were part of a movement away from the formal Queen Anne houses so dominant in the second half of the nineteenth century and toward the simpler Craftsman or bungalow styles.

Prosperity, Depression, and World War II

Between 1923 and 1927 a period of economic prosperity brought with it one of the greatest housing booms in the history of the country. The new availability of automobiles stimulated construction of houses in the suburbs, where land was relatively cheap. More than seven million new dwelling units were started in the 1920s; annual housing peaked at 937, 000 units in 1925, a figure that would be unsurpassed for the next twenty years. By 1932, housing production had fallen to 134, 000 units and the industry, along with the rest of the economic and financial structure of the country, was spiraling downward. Property values fell by more than 25 percent from 1929 to 1932, eliminating homeowner equity and increasing mortgage debt from 36 percent of value in 1928 to 61 percent in 1932. As foreclosures increased, approximately one million people were forced into homelessness. The administration of President Franklin D. Roosevelt drew housing into the purview of the federal government during the 1930s by creating, along with several other programs, the Federal Housing Administration to provide federal insurance for home loans.

The crisis of World War II produced the first mass production of prefabricated houses. Builders devised factory-built, standardized building components such as wall and ceiling panels, and utilized light metal framing with girders and trusses that allowed for greater spans. Poured concrete foundations became standard. Many technological advances were made with the help of leading universities such as the Massachusetts Institute of Technology. This cooperative effort established the basis for the hugely expanded postwar construction industry. The small, craft-oriented, homebuilding industry became more like the rest of American industry in general.

Postwar Prosperity, the Flight from the Cities, and Racial Discrimination

Americans came out of World War II with higher incomes to buy better houses. Housing starts in 1946, at 1, 023, 000, were higher than they had been in 1925, the previous record year, and they reached nearly 1.5 million in 1949.

During this boom period the average cost of building a house rose from \$4, 625 in 1945 to \$7, 525 in 1949. Veterans Administration guaranteed loans were a major factor in helping to house the millions of servicemen returning from the war. The proportion of nonfarm home ownership rose from 41.1 percent in 1940 to 50.8 percent in 1945, the fastest increase of such magnitude to take place in the twentieth century. By 1956 the owner occupied portion of nonfarm occupancy would be 59 percent, a huge increase from that of 1940.

The 1950 Census showed an improvement in the physical condition of the country's housing. Based on a standard of more than one person per room, overcrowding was reduced from 20 percent in 1940 to 15 percent in 1949. As the country continued its emergence from the depression and war years, those who could afford it largely fled the cities, leaving behind a poor minority population, a diminished commercial core, and growing slums. An American Public Health Association Report in 1948 recognized racial segregation and substandard housing in central cities as major problems. The Housing Act of 1949 favored «a decent home and a suitable living environment for every American family, «but it was years before racial segregation in housing was addressed comprehensively. In 1962 President John F. Kennedy issued an executive order barring discrimination in the sale, lease, or occupancy of residential property owned or operated by the federal government. The Civil Rights Act of 1964 barred racial discrimination in any housing requiring federal funding assistance and the Fair Housing Act of 1968 established equal housing opportunity as official U.S. policy.

Expanding Suburbs, More Apartment Buildings

The new American middle class wanted the suburban houses that prosperity could make available to them in the postwar period. The ideal was a single-family house for the nuclear family on a large lot away from the deteriorating inner city. Builders acquired large tracts of land relatively inexpensively at the perimeters of towns and cities, secured government-insured advance financing, installed streets and other infrastructure, and mass produced standardized ranch-style housing. Production of mobile homes, which had been around since the 1930s when they were called trailers, began to expand rapidly in the 1960s as assembly-line techniques were improved.

The development of the elevator and steel frame construction had promoted intense multistory apartment building construction in the late nineteenth century in large cities where land was too expensive to justify single-family houses. Yet in 1960 only about 5 percent of housing units were in apartment buildings of ten or more units, except for New York City, Chicago, Los Angeles, Miami, and Washington, D.C. Apartment construction increased in the 1960s as a result of smaller households and higher per-household income. There was a surge of luxury apartment buildings with balconies, swimming pools, large lobbies, and

tenant services such as guest screening, message and package reception, and security features. In addition to rental units, condominium and cooperative apartments, which had some of the features of home ownership, became popular.

Seeking the American Dream

Despite the energy crisis of the mid-1970s and decreasing family size, houses became larger as they were recognized as the best hedge against inflation and the most important source of wealth creation for families. Three bedrooms and two bathrooms became standard. Total housing starts, including shipments of mobile homes, reached an astonishing 21, 482, 000 in the 1970s. This production level was at the rate of approximately one new dwelling unit for every ten people in the country. The median price of new conventional single-family dwellings rose from \$23, 400 to \$62, 900 during the decade. Economist Alan Greenspan estimated in 1977 that the market value of the nation's entire stock of single-family, owner-occupied houses was increasing at an annual rate of \$62.2 billion, almost all of which was being converted to cash through mortgages. This money was recirculating in the economy, bringing the United States out of the mid-1970s recession and spurring more housing production. Capital gains from housing outstripped by three to one the gains taken by private investors in the stock market at this time.

In the late 1970s builders began to create new types of housing clusters including duplexes, triplexes, and fourplexes. Large landscaped developments often included a mix of detached houses, apartment buildings, and townhouses around a central feature such as a golf course or other recreational facility. Eventually the more expensive of these developments would become socially segregated «gated» communities with access limited to residents and their guests.

By the 1980s the national homeownership rate was nearly 65 percent, with the highest rate among people from ages fifty-five to sixty-five. The incidence of new two-story houses increased, and all new houses had more bedrooms, bathrooms, and fireplaces. At the other end of the scale were the homeless whose numbers reached an estimated 500, 000 to 750, 000 during the 1980s.

By 1999 the average new house had two or more stories, three bedrooms, 2.5 bathrooms, central heating and air conditioning, a working fireplace, and a two-car garage. Its average size was 2, 250 square feet, 50 percent larger than the average new house in 1970.

The number of housing units in the United States at the end of the twentieth century was nearly 116 million, with 91 percent of these occupied on a full-time basis. Approximately one-third of the remaining 9 percent were seasonal, recreational, or occasionally used dwellings, an indication of the housing prosperity of Americans. More than 66 percent of the units occupied on a full-time basis were occupied by their owners; in 1900 only 36.5 percent of dwelling

units were owner occupied. The average household size at the end of the century was 2.6, a number that had been 4.8 in 1900 and 3.7 in 1940.

Housing is an essential component of the nation's economy and a prime indicator of national economic direction. Home ownership is usually the major form of investment for individuals and households, and a key to financial stability and upward social mobility. Home ownership has long been the American Dream, the goal toward which many strive.

Housing, in general, living accommodations available for the inhabitants of a community. Throughout the 19th cent., with the advent of the Industrial Revolution, housing as a problem worsened as urban populations expanded. The crowding of cities and factory towns by workers led not only to severe housing shortages but also to the deterioration of existing housing and the growth of slums. The problem was aggravated by the erection of substandard housing for workers and by speculators seeking high profits.

Reforms in Great Britain

Inadequate housing for the increasing urban population led, in the mid-19th cent. in Great Britain, to the development of a reform movement. Humanitarian and philanthropic groups first took up the cause of workers' housing. The Society for Improving the Dwellings of the Labouring Classes was established in 1845 and was followed by similar organizations dedicated to the building of low-rent dwellings. Ultimately, public opinion encouraged Parliament to pass (1851) the Shaftesbury Acts (the Labouring Classes Lodging Houses Acts). They provided for the construction of lodging houses according to certain minimum standards.

Slum clearance began with the Torrens Act of 1868, which provided for the demolition or improvement of unsanitary dwellings. After the turn of the century much was done in Great Britain toward eliminating slums and constructing model tenements; the garden city was one solution offered to the housing problem. The first Housing and Town Planning Act in 1909 granted local governments the power to oversee housing development. The large-scale destruction of housing during World War II resulted in severe shortages after 1945; between 1945 and 1970 about 7 million new dwellings were built in Great Britain.

Reforms in the United States

In the United States, housing problems-in particular the growth of slums-became acute during the 19th cent. in the cities of the eastern seaboard and in the larger Midwestern cities. A leading cause was the heavy immigration from Europe that began in the middle of the 19th cent. and reached a peak at the turn of the century. The first housing law (the 1867 New York City tenement house law) was revised in 1879 to prohibit windowless rooms. The findings of a

tenement house commission resulted in a new law in 1901, requiring better provision for light and ventilation, fire protection, and sanitation. Most U.S. city and state housing laws in the following years were based on those of New York City.

Until World War I there was no government housing in the United States. Then temporary dwellings were put up for defense workers. The U.S. government lapsed into almost complete inaction with regard to building housing until the advent of the New Deal. The National Housing Act (1934) created the Federal Housing Administration (FHA) to undertake a nationwide system of home loan insurance. It also established, by means of mortgage insurance regulation, minimum standards for construction, for design, and for location.

Low-cost housing projects, including farm-family homes sponsored by the Resettlement Administration, were coordinated in 1937 under the U.S. Housing Authority, which financed urban low-rent and slum clearance developments by making loans at low interest rates. Such loans were later extended to rural housing. The Lanham Act (1940) authorized federal operation of a large-scale housing program for defense workers.

To unify the many federal housing agencies, President Roosevelt created (1942) the National Housing Agency, which included the Federal Public Housing Authority, the Federal Home Loan Bank Administration, and the FHA. But the total wartime construction of permanent homes was far below peacetime levels, while the demand for housing rose sharply with a high marriage rate, migration from farms to cities, greater buying power, and later the return of veterans. Complicated by building codes, union practices, and labor and material shortages, the housing deficiency remained serious after the war, and federal rent controls continued for some time.

A national housing policy began to emerge when Congress passed the Housing Acts of 1949 and 1954, aimed at easing the housing shortage and eliminating slums; their goal was a decent home for every family. The Housing and Urban Development Act of 1965 created a separate cabinet-level Dept. of Housing and Urban Development (HUD). In 1966 the Model Cities Act coordinated government assistance to selected low-income areas of cities.

Housing since then often has been caught up in debate over rent controls, homelessness, the failure of savings and loan associations, and the buying and selling of political influence by government administrators and building developers. From 1980 to 1987, 2.5 million low-cost housing units were lost, and the federal government reduced its subsidies for construction by 60 %. In response, some private groups like Habitat for Humanity have tried to help individuals buy and renovate low-cost housing. Housing advocates have argued for public housing reform, including controls on speculation and on rent (about 36 % of occupied U.S. housing units are rentals).

Housing Problems in Other Countries

After World War II, the countries of continental Europe faced acute housing shortages. Most postwar efforts were directed at rebuilding major industries, and house construction suffered as a result. However, once the economies were stable, attention turned to housing. In most countries of Africa, Asia, and Latin America, urban housing shortages are today particularly severe as a result of population increases, rapid urbanization, and the migration from rural areas to cities. It is estimated that in Latin America alone, four or five million families live in substandard urban dwellings. The depressed economies and social inequities of many governments have worked against development of adequate housing programs.

Housing

The ancient Greek word for household, *oikos*, is the root of the modern word «economy». In early modern Europe, housing was associated both with living and working, consuming and producing. This combined function shaped the outward form and internal organization of houses during the era. It also introduces complications to explicating the theme of housing, because the focus could be equally on the domicile itself or on the groups of people who inhabited it. Contemporary officials often used the term *hearth* to refer to households, though the term refers to the structure used to heat a room as well. A lack of sources makes it difficult to determine who actually lived together in the early modern era: in some cases, several households lived together under one roof, perhaps in separate rooms or all together. It is also difficult to determine how people used space inside the house: there are very few descriptions of house interiors and little way of knowing how representative those descriptions are.

There was no single «typical» house of the early modern era. For one thing, there was a strong tendency toward regional cultural patterns, both among and within linguistic and political units, which were expressed in housing styles. Few things more readily distinguish different regions than the prevailing style of houses, especially in the countryside. Regional differences resulted in part from local variations in building materials, but they clearly had deeper cultural roots as well. Housing types were also shaped by the fundamental difference between urban and rural living conditions. Though the overwhelming majority of Europeans lived in the countryside, the urban world was often more dynamic and exhibited a greater variety of living conditions. Town size magnified those differences. A few great cities, such as Paris or London, had a completely different housing mixture from the typical «large» city of about 20, 000 inhabitants, not to mention the numerous small towns of the era. Variation in status and the work people performed also affected how and where they lived. The houses of nobles and patricians were quite different from those of peasants and artisans. Higher status homes certainly displayed a greater variety of styles

than did lower status homes. Even more importantly, however, higher status homes comprise the greater body of evidence about what was in early modern homes and how they were used. Thus, while one may talk about some general trends in all housing during the era, the key features of housing must be viewed in wider social and geographical contexts.

Building Houses

There were no significant technological changes affecting living conditions in early modern Europe. Building materials and practices did not change much. As a rule, the types of houses that people lived in at the end of the eighteenth century would have been familiar to those of the early sixteenth century, aside from external ornamentation. Indeed, many houses remained standing for the entire period, though wood-frame houses typically needed replacing every century or so. This continuity of building styles was particularly pronounced in the housing of peasants and artisans. However, elite housing did change in function and style over the period, so that a noble palace at the end of the early modern era would have appeared quite different from one at the beginning of the era.

There were three main building materials for houses: wood, stone, and brick. One may divide European housing into three zones according to which of those materials was predominant in buildings because of local availability of that material. There was, however, a status hierarchy of building materials, so that some towns would include a few stone or brick buildings in among a majority of wood-frame houses. In the great cities, homes of the elite were constructed of stone or brick, while homes in poorer districts were built of wood. Stone and brick also became more prevalent building materials over time. By the seventeenth century, Paris had (poorly enforced) regulations prohibiting wood construction. London also built more extensively in stone and brick after the devastating fire of 1666. The progress of stone building in large cities was varied. The French city of Cambrai had numerous stone houses by the middle of the seventeenth century. Nearby Rouen did not begin to build in stone until the end of the eighteenth century. The German city of Nuremberg built houses with stone first floors and half-timbered upper stories.

Wood was the favored building material in both the towns and countryside of the heavily forested parts of northern and central Europe. It was unusual for houses to be built entirely from logs. Instead, most structures were half-timbered: large hewn logs formed the frame for the house, while the spaces within the frame were filled with wattle and daub (a mixture of sticks with mud or plaster), with bricks, or stucco. Timber for housing construction was not, in fact, a highly developed industry in the era. Timber exports were more likely to be sent for shipbuilding than housing, so half-timbering eased demand for large logs. Indeed, in some port towns, the primary source of timber for house

construction was old ships. Half-timbering created a distinctive colorful urban landscape, remnants of which exist today in some German, French, and English towns. By the late eighteenth century, however, half-timbered town houses were often considered excessively rustic. The facades of such houses were plastered over to create a more classical effect.

A major danger of the widespread use of wood in construction was fire. Fires leveled many towns, such as Stockholm, Sweden, in 1625. Fear of arsonists was a common concern of householders and town officials alike.

In most of southern Europe, and some parts of northern Europe, timber was much scarcer than stone, so stone and mortar were the preferred building materials for both towns and the countryside. The quality of stone used in construction could vary widely. Almost all structures were constructed from stone quarried locally. Small towns and villages took on a unified landscape from the color and texture of the locally quarried stone. For example, the all-red sandstone of the village of Collonges-la-Rouge in France distinguished it from the mostly golden or gray stone of neighboring towns. More elegant housing might rely on stone imported from a greater distance, but most quarries were small operations that depended on major public projects such as churches to drive most of their activity.

In the coastal regions of northern Europe and in the larger cities of southern Europe, brick was the preferred building material. Brick making was a significant industrial operation, the center of which was usually located in the countryside near a town. Unlike stone and wood, brick was used almost exclusively for urban housing. Farmhouses in regions where urban brick houses predominated were usually half-timbered or wattle and daub. Bricks were well designed for constructing geometrically proportioned, stable houses, which produced regimented streetscapes. In northern European cities in the Netherlands and coastal Holy Roman Empire, exposed brickwork helped define the city landscape in the same way that colored stone defined some southern European towns. In the southern European cities that used bricks instead of stones, the bricks were usually covered with stucco, so that it was not immediately apparent that brick rather than stone was the primary building material.

Roofing material was equally subject to the interplay of local availability and a slight status hierarchy of materials. In the countryside, both stone and half-timbered houses were usually roofed with thatch. More substantial houses in the countryside and most urban houses were covered with shingles, which might be made of wood, locally quarried slate, or kiln-dried tiles. Only the houses of the wealthiest people would be sheathed in lead or copper.

The building trades themselves also underwent little change during this era. Most rural houses and houses of artisans were built by guild craftsmen, masons, and carpenters, without the assistance of architects. Some towns enforced

building regulations to ensure effective design. In sixteenth-century Nuremberg, for example, the town building department acquired many drawings of new structures and additions that were to be built, few of which were created by architects. By the end of the early modern era, architects began to play a more prominent role in constructing housing for urban professionals as well as noblemen.

Peasant Houses

The majority of the European population lived in villages. Most villages exhibited a uniform housing type, because there were only small disparities of wealth and work among most peasants. Nevertheless, one can find some differentiation between the houses of the rural poor and those of the more substantial farmers. The most common dwelling for the rural poor was a one-room house, sometimes called a «long house», where the residents slept, ate, and worked in the same space. In its most basic form, it had an open hearth in the middle of the room and a hole in the ceiling to let the smoke out. The house was built on the ground, which served as the floor. Straw or grass was strewn on the floor to reduce dampness. Light could enter the house through windows, which lacked glass but could be closed by wooden shutters. More advanced houses had a brick or stone hearth with a chimney located on one side of the house instead of a centrally located firepot. Such houses had glass windows to let in light and keep out the cold. It also became increasingly common for even simple farmhouses to be built on excavated foundations and wood plank floors rather than simply resting on the ground.

For modern observers, and even for some contemporaries, one of the most striking features of the single-room house was that animals would be housed under the same roof as people. Writers who stayed at such rural farmsteads commented on being kept awake by the noises of the cows. However, animals did not have free rein of the house: there was usually a barrier between the human inhabited space and the stalls for the animals.

Sometimes, more than one family shared the one-room house. In any case, privacy was very rare. The poorest households possessed a very small repertoire of furniture. The most important item in a peasant household after the hearth was the bed. It consisted of a frame, a mattress, and usually a canopy whose curtains could be closed to attain some privacy. There was usually a long table for eating, with benches rather than chairs for seating. Many benches served double service as chests. Extra clothing, linens, and personal effects were kept in chests or armoires, which were rudimentary in the poorest households and more elaborate in wealthier ones. Though almost all parts of Europe had colorful folk-art traditions in furniture or pottery, the overall appearance of the interior of most peasant houses would have been dark and unadorned.

Many peasants lived in a slightly more elaborate version of the long house. Instead of consisting of a single room, the house was divided into two spaces: a foyer and rooms. Cooking, eating, and work all took place in the foyer. The rooms were separated from the foyer by walls, with doors that could be closed and locked for at least some privacy from the work environment. Such houses might also have a separate cellar and storeroom for grain and an upstairs room, which could be used as a bedroom. This room was usually accessible by a trapdoor and ladder rather than a stairwell. It was less common for animals to be housed under the same roof as humans in these larger houses; instead they had stalls in a barn.

The main work of rural households was, of course, agriculture. So the main house was usually built as part of a larger courtyard in which the everyday tools of farming were kept: wagons, plows, harnesses, a dung heap. More prosperous peasants might have several buildings built around the courtyard, such as grain storerooms, separate stalls for animals, sheds, possibly even a baking oven, though that was usually a communal building rather than part of an individual's property. The courtyard itself might be separated from the street by a large gate or doorway that could be closed. Some of these gateways provided an opportunity for self-expression. In Germany, it was fairly common for a married couple to inscribe their names, the date of construction, and a pious statement over the entryway of a new house.

There were also some specialized forms of housing in the rural world. There were three structures which, while not present in every village, were central to peasant life: the parsonage, the tavern, and the mill. The parsonage, or priest's house, was usually just a large version of the typical peasant house of the region. Throughout the early modern era, the pastor or priest participated in the broader agricultural economy as well as attending to his spiritual duties, so his house had to be arranged to perform both kinds of tasks. Rural inns, like their urban counterparts, had to provide lodging and meals to travelers, but relied primarily on a local customer base for support. Mills were fundamentally important for rural society because they converted grain to flour; their living space was subordinated to their economic function. The sites of both windmills and water mills depended on geography. Building a mill was a greater capital investment than building a house, so most mills were built with higher quality materials with the intention that they would last for several generations. Millers, innkeepers, and pastors were usually the wealthiest members of the community, so their housing was the most elaborate in the village.

In most parts of Europe, peasants lived in nucleated villages. It was possible to survive in a village with only a one-room house and no elaborate courtyard because much work was done communally, so one's house did not have to have all the required work materials. But large isolated farmhouses were characteristic of Alpine lands, in which raising animals was more important than

tending cereal crops. Isolated farmsteads had to be self-sufficient because there were no neighbors to rely on. As a result, the houses of isolated farmsteads were significantly bigger than those in villages, even if the farmstead occupants were sometimes poorer than some of the more successful inhabitants of villages. The farmstead houses almost invariably consisted of two or even three stories, with stalls for animals in the lower story. Since these houses were often built in hilly country, they were arranged with ground access to the upper story, which was a large open space for storing grain and supplies.

Urban Artisan Housing

Perhaps the most important distinction within the towns of early modern Europe was between citizens and noncitizens. In almost all towns, ownership of a house in town was a prerequisite for citizenship. The single-family-owned house, therefore, was the norm for merchants, professionals, and most independent craftsmen, the bulk of the citizens in urban Europe during this era. Not everyone aspired to or acquired citizenship, however. Many of the working poor lived crowded together with other families in single houses. For example, in seventeenth-century Augsburg, 70 percent of the households lived in houses containing an average of four families. Though there was some tendency for the houses of the wealthiest citizens to concentrate in the center of town near the public buildings, different trades were usually mixed together throughout town. This mixing of wealth and occupation was one of the most striking characteristics of the small- and medium-sized towns of the era.

Space was at a premium in urban areas. House facades directly abutted the street and were built one on top of the other. The characteristic urban street was a narrow alley with houses built close enough to block out the sun on the street. In some towns, the upper stories of houses overhung their entrances, almost touching the houses across the street. Houses generally showed a narrow front to the street and extended deeply to the rear. In the far rear, there was usually a garden or courtyard. In smaller towns (and earlier in the sixteenth century) ordinary houses tended to be only two stories tall. The first story was taller than the second. In those cities that experienced strong population growth, houses tended to be built upward, though it was very rare for them to reach more than five stories.

The interior of an artisan's house was organized for craft production, not as a haven from work. It often made sense to have one fairly undifferentiated room on the main floor of the house. That room would serve as kitchen, eating area, and workspace. Sometimes journeymen and apprentices would also sleep in the work area, rolling up their bedding at the start of the workday. There was usually at least some sense of separation between work areas and living areas, even in the large rooms, but that separation sometimes blurred. As late as the eighteenth century, one could still find blacksmiths' houses where the kitchen

hearth also served as the foundry for the iron. The specific craft of the homeowner influenced home design and location. Tanners, for example, had to be located near a watercourse (and tended to produce unpleasant odors), so they were concentrated in the same neighborhood. Their houses' interiors included built-in vats for soaking and treating of hides, which had to be separate from living spaces. Such occupational needs placed constraints on housing design.

Most artisan houses had two or three rooms on each floor. There was often a parlor on the first floor, in addition to the main work area or shop. This room was also a public space of the household. The upstairs rooms were usually for sleeping. It is possible that one could find greater privacy in a typical urban home than in its rural equivalent, but it was still mostly a shared rather than isolated living situation.

Though it is unlikely that conditions were quite as squalid as they would become in the first decades of the industrial revolution, it is clear that many urban workers throughout the early modern era lived in dingy, crowded conditions, with little that could be considered luxuries or even comforts. Furnishings in artisan households were mostly comparable to those of the peasantry: sturdy furniture and supplies with perhaps a smattering of folk-art coloring. Studies of inventories at death show that the most important piece of personal property of the poor was the bed and accompanying linens. Urban houses differed from rural ones in some other respects. Most rooms in the urban house had fireplaces to keep them warm in the winter. Latrines inside the house became common place in the sixteenth century; in some cities, such as in Rouen in 1519, interior latrines were mandated by law. These comforts suggest that urban housing was more advanced than rural housing, even for the poor.

Urban Elite Housing

Dutch genre paintings by Vermeer, Steen, and de Hooch, among others, show sumptuous interiors that are not at all like the rather drab artisan households. The Dutch Republic was in the forefront of a broader based development of a self-confident «bourgeois» culture. Indeed, the explosion of genre painting in the Netherlands was partly a symptom of the new culture that it portrayed. Urban elites, and even those who possessed above-average wealth, no matter what their status, began to decorate their homes in a more elaborate style, akin to that of the nobility. Inventories show that paintings and prints were some of the decorations that became commonplace in bourgeois homes.

The interiors of urban elite homes reflected two important cultural trends. The first was a sharper separation of public and private lives. Unlike in the houses of urban artisans, the kitchen, storerooms, and servants' quarters were in the basement of the houses of merchants and members of the professions, separate from the general living and working space. A modern eighteenth-century town house consisted of ten to fifteen rooms spread over three or four

stories. The first floor was mostly for interaction with the public. The key room was the parlor, where guests were greeted. Merchant houses also included a counting room or study that could be a place of repose but also a place to meet clients. The second floor contained the main dining room for entertaining guests, but also semi-private rooms such as the drawing or dressing room. Architects recognized that homeowners might conduct some business in the drawing room and thus advocated separating the drawing room from the bedrooms, which were often placed on the third floor.

The second cultural trend reflected in urban elite homes was the emergence of a consumer culture. Simple comforts that characterized most artisan homes by the eighteenth century, such as hearths in every room, internal latrines, and glass windows, were widespread in elite homes at the beginning of the early modern era. In addition, the rooms of bourgeois town houses were decorated profusely with moldings, wainscoting, marble mantelpieces, carpets, drapery, and mirrors. The increasing importance of new decorative objects such as mirrors, clocks, and sofas can be traced through inventories. Again, these trends were most conspicuous in large cities such as London and Paris, but they also extended to medium-sized towns. The Dutch were particularly noted for their comfortable and clean houses. In Germany, clocks were becoming an accessory in professional homes by the 1720s. A building boom in the late eighteenth century, exemplified in towns like Bath, created town houses appropriate for such conspicuous consumption.

Noble Housing

Housing in towns and villages in the early modern era consisted primarily of elaborations on medieval forms. But noble housing underwent a conspicuous change between the medieval and early modern eras, caused mostly by changes in the quintessential noble activity: warfare. Gunpowder weapons and artillery rendered the fortified castle useless as a safe haven for nobles. Some saw their castles destroyed during royal pacification campaigns; others decided that castles were uncomfortable and incompatible with the kind of splendor that went with living nobly. So noble housing became oriented toward display rather than defense.

Already in the Renaissance, urban nobles in Italy had revived the country villa as a retreat from urban life. The villa was modeled on the ancient Roman estate, but without the slaves. Architecturally, it incorporated classical notions of proportion and harmony that typified the Renaissance. In northern Europe, some royal palaces were built as a retreat from the hectic pace of urban life. Many were used primarily as hunting lodges. But many northern nobles were already primarily based in the rural world. The palace replaced the castle as the house from which nobles exerted their control over the countryside. The pace of the conversion of castles or construction of noble palaces in the countryside varied

from region to region in Europe. Poorer noblemen had to be content with modest additions or remodeling of already existing castles. The largest concentration of new construction was in France and England. In England, the secularization of the monasteries opened large properties to development by regional elites. A wave of «great houses» went up beginning in the early sixteenth century. In eastern Europe, by contrast, rural palaces continued to exhibit clearly their function as agricultural centers as well as centers of noble power.

Part of the function of noble housing was the extravagant display of wealth and authority. A rural palace was symbolic as well as domestic architecture. It achieved its impact by its setting as well as by its facade and furnishings. Noble landowners might divert a river or extend a moat to make the approach to the main buildings more dramatic. Extensive formal gardens were an important accompaniment to the main structure.

The impact created by the approach to the building was then reinforced by its interior layout and decoration. In the country houses of England, the centerpiece of display was the hall, which one entered from the front door of the house. This was the most public space in the house and was decorated to focus attention on the head of the house, even when he was not present. Placing a great stairway in the hall became increasingly common, turning what had been a necessary but decidedly secondary architectural feature into another element of prominent display. Great houses had innumerable other rooms branching off from the hall, with increasing degrees of privacy associated with them.

The most prominent room in the house after the hall was the great chamber. Originally, it had been a general-purpose sleeping, eating, and meeting room of the head of the house. Increasingly, the sleeping area of the householder developed into a suite of rooms, including an antechamber and dressing room. An important part of the work of a nobleman was entertaining other noblemen. Great houses and palaces contained apartments in the family's own wing of the house and also in other wings to accommodate visitors. The status of visitors could be seen by where they were lodged in the house. An apartment consisted of four rooms: a sleeping chamber, a dressing room, an antechamber, and a room for personal servants.

As in bourgeois houses, the service rooms of the house were generally kept separate from both the public and private spaces. Some servants, of course, lived in rooms adjacent to their masters' or mistresses' chambers, but others slept in a separate section of the house, often dormitory style, when they were not on duty. Undoubtedly the central service room of the house was the kitchen. Along with the pantry, buttery, bakehouse, larder, and brewery, kitchens were kept out of the way of regular traffic. There was almost no space devoted exclusively to children, though most great houses had a separate nursery for the very young.

Noble houses experienced the same expansion of domestic comforts as bourgeois homes did. By the eighteenth century, it was commonplace for

palaces to have running water, interior latrines, and fixed lighting. Instead of a single public room, such as the parlor, noble houses had a library or study, galleries, and a chapel. Formal gardens and outbuildings such as an orangerie (akin to a greenhouse) or folly (akin to a gazebo) provided another setting for nobles to meet or enjoy privacy. Indeed, gardens, in addition to their function as display, played an important role in noble intimacy and escape from the very public activity of much of the house.

The growth of the state drew more and more nobles to capital cities. The same issues of display and representation affected the housing nobles chose to live in or build in cities such as Paris and London. City layouts made it difficult to recreate the dramatic effect of the approach to a rural palace. Instead, the interiors and courtyards became the primary areas for dramatic display. Italy, which already had an established urban nobility in the Middle Ages, set the initial standards for the urban palazzo. In most respects, they followed the same internal organization as their rural counterparts. The architectural principles of «classicism» established in Paris became the norm for urban noble housing throughout Europe. In the eighteenth century, court cities such as Berlin, Vienna, and Munich experienced a building boom of noble houses based on variants of the classical and baroque styles.

Housing As Property

The populated areas of Europe had already developed clear property lines at the beginning of the early modern era. New buildings were visibly constrained by these legal boundaries. This situation was particularly acute in urban areas, where the existing structures meant that the only way to increase the area of one's house was to build it upward, with additional stories, or to purchase a new plot of land with greater space. But even in villages, property lines defined housing spaces in the core of the village that were clearly differentiated from the croplands and pasture. Houses were restricted to that core. Once built, a house was expected to survive for a long time before being replaced. Increasing population in the countryside spurred the construction of new housing in the eighteenth century, often on subdivided plots. But, except in cases of a major catastrophe, such as fire, building a house was an infrequent phenomenon in most villages. Many structures built in the early modern era survived into the industrial era. The most extensive building projects for new housing were in the expanding suburbs of major cities or in newly founded court cities such as Versailles, Karlsruhe, or Turin, built explicitly on a grid pattern on property made available by the prince for the purpose of dynastic display.

Relatively clear property boundaries fostered a real estate market. One can, of course, find many instances of a single family residing on a piece of property for several generations. But some property became available because a lineage died out, and still more became available because of a change in the economic

fortunes of a lineage. So purchasing a house was not at all a rare occurrence. Prices, of course, varied greatly. Even within the peasantry and artisan class, there were clear gradations in the quality of housing. Fancier peasant houses were worth about five times as much as cheaper ones in the housing market. Joint ownership of houses was also possible.

In the great cities, urban expansion was fostered by speculation in real estate. Urban elites invested in numerous building projects in suburbs and occasional renovation projects in the center of town. Some of these projects, the most famous of which is probably the Place Royale in Paris, completed in 1612, attracted elite buyers. Many others appealed primarily to people of middling means. Still others were rented out, either short term for noncitizens or long term for the working poor. The Fuggerei in Augsburg is perhaps the best-known example of housing for the working poor built by elite investors, but it was exceptional in being built primarily as a charitable institution rather than as an investment. In some cities, rental housing was a significant part of the housing stock. Fifteen percent of the population of Lübeck lived in rented cellars or rented row houses in alleys. The owners of such rental properties were often the urban elites of the towns.

By the end of the eighteenth century, urban housing was beginning to take on characteristics that would become widespread in the nineteenth century. Increasing population in towns such as Manchester put pressure on the housing stock for the working poor. At the same time, town house developments targeted at the upper middle classes, such as New Town, Edinburgh, became an important economic factor reshaping cities. They fostered speculation in both land and houses, which in turn fed urbanization on an unprecedented scale.

TEXT 5

Задание 1. Прочитайте текст, стараясь понять его общее содержание.

Задание 2. Выполните полный письменный перевод текста. Объясните, какие переводческие трансформации вы используете.

Brick

Small building unit in the form of a rectangular block, first produced in a sun-dried form at least 6, 000 years ago. Clay, the basic ingredient, is mined from open pits, formed, and then fired in a kiln to produce strength, hardness, and heat resistance. Brick was the chief building material in the ancient Near East. Its versatility was expanded in ancient Rome by improvements in manufacture and by new techniques of bonding. Brick came to be widely used in Western Europe for the protection it offered against fire. How is a brick made?

Background

The term brick refers to small units of building material, often made from fired clay and secured with mortar, a bonding agent comprising of cement, sand, and water. Long a popular material, brick retains heat, withstands corrosion, and resists fire. Because each unit is small – usually four inches wide and twice as long, brick is an ideal material for structures in confined spaces, as well as for curved designs. Moreover, with minimal upkeep, brick buildings generally last a long time.

For the above-cited practical reasons and because it is also an aesthetically pleasing medium, brick has been used as a building material for at least 5, 000 years. The first brick was probably made in the Middle East, between the Tigris and Euphrates rivers in what is now Iraq. Lacking the stone their contemporaries in other regions used for permanent structures, early builders here relied on the abundant natural materials to make their sun-baked bricks. These, however, were of limited use because they lacked durability and could not be used outdoors; exposure to the elements caused them to disintegrate. The Babylonians, who later dominated Mesopotamia, were the first to fire bricks, from which many of their tower-temples were constructed.

From the Middle East the art of brickmaking spread west to what is now Egypt and east to Persia and India. Although the Greeks, having a plentiful supply of stone, did not use much brick, evidence of brick kilns and structures remains throughout the Roman Empire. However, with the decline and fall of Rome, brickmaking in Europe soon diminished. It did not resume until the 1200s, when the Dutch made bricks that they seem to have exported to England. In the Americas, people began to use brick during the sixteenth century. It was the Dutch, however, who were considered expert craftsmen.

Prior to the mid-1800s, people made bricks in small batches, relying on relatively inefficient firing methods. One of the most widely used was an open clamp, in which bricks were placed on a fire beneath a layer of dirt and used bricks. As the fire died down over the course of several weeks, the bricks fired. Such methods gradually became obsolete after 1865, when the Hoffmann kiln was invented in Germany. Better suited to the manufacture of large numbers of bricks, this kiln contained a series of compartments through which stacked bricks were transferred for pre-heating, burning, and cooling.

Brickmaking improvements have continued into the twentieth century. Improvements include rendering brick shape absolutely uniform, lessening weight, and speeding up the firing process. For example, modern bricks are seldom solid. Some are pressed into shape, which leaves a *frog*, or depression, on their top surface. Others are extruded with holes that will later expedite the firing process by exposing a larger amount of surface area to heat. Both techniques lessen weight without reducing strength.

However, while the production process has definitely improved, the market for brick has not. Brick does have the largest share of the opaque materials market for commercial building, and it continues to be used as a siding material in the housing industry. However, other siding materials such as wood, stucco, aluminum, plaster, and vinyl are strong competitors because they cost up to 50 percent less, and some (notably stucco and plaster) offer built-in insulation. Yet these systems can cost up to 1.75 times that of brick, which also requires less maintenance. Other materials that compete with brick despite their usually higher cost include precast concrete panels, glass, stone, artificial stone, concrete masonry, and combinations of these materials, because advances in manufacturing and design have made such materials more attractive to the builder. According to the U.S. Industrial Outlook, the use of brick as a siding material for single-family homes dropped from 26 percent in 1984 to 17 percent in 1989.

Raw Materials

Natural clay minerals, including kaolin and shale, make up the main body of brick. Small amounts of manganese, barium, and other additives are blended with the clay to produce different shades, and barium carbonate is used to improve brick's chemical resistance to the elements. Many other additives have been used in brick, including byproducts from papermaking, ammonium compounds, wetting agents, *flocculents* (which cause particles to form loose clusters) and *deflocculents* (which disperse such clusters). Some clays require the addition of sand or *grog* (pre-ground, pre-fired material such as scrap brick).

A wide variety of coating materials and methods are used to produce brick of a certain color or surface texture. To create a typical coating, sand (the main component) is mechanically mixed with some type of colorant. Sometimes a *flux* or *frit* (a glass containing colorants) is added to produce surface textures. The flux lowers the melting temperature of the sand so it can bond to the brick surface. Other materials including graded fired and unfired brick, nepheline syenite, and graded aggregate can be used as well.

The Manufacturing Process

The initial step in producing brick is crushing and grinding the raw materials in a separator and a jaw crusher. Next, the blend of ingredients desired for each particular batch is selected and filtered before being sent on to one of three brick shaping processes – extrusion, molding, or pressing, the first of which is the most adaptable and thus the most common. Once the bricks are formed and any subsequent procedures performed, they are dried to remove excess moisture that might otherwise cause cracking during the ensuing firing process. Next, they are fired in ovens and then cooled. Finally, they are destacked—automatically stacked, wrapped with steel bands, and padded with plastic corner protectors.

Grinding, sizing, and combining raw materials

- First, each of the ingredients is conveyed to a separator that removes oversize material. A jaw crusher with horizontal steel plates then squeezes the particles, rendering them still smaller. After the raw materials for each batch of bricks have been selected, a scalping screen is often used to separate the different sizes of material. Material of the correct size is sent to storage silos, and over-sized material goes to a hammermill, which pulverizes it with rapidly moving steel hammers. The hammermill uses another screen to control the maximum size of particle leaving the mill, and discharge goes to a number of vibrating screens that separate out material of improper size before it is sent on to the next phase of production.

Extrusion

- With extrusion, the most common method of brick forming, pulverized material and water are fed into one end of a *pug mill*, which uses knives on a rotating shaft to cut through and fold together material in a shallow chamber. The blend is then fed into an extruder at the far end of the mill. The extruder usually consists of two chambers. The first removes air from the ground clay with a vacuum, thereby preventing cracking and other defects. The second chamber, a high-pressure cylinder, compacts the material so the auger can extrude it through the die. After it is compressed, the plastic material is forced out of the chamber through a specially shaped die orifice. The cross-section of the extruded column, called the «pug», is formed into the shape of the die. Sections of desired length are cut to size with rotating knives or stiff wires.

In molding, soft, wet clay is shaped in a mold, usually a wooden box. The interior of the box is often coated with sand, which provides the desired texture and facilitates removing the formed brick from the mold. Water can also be used to assist release. Pressing, the third type of brick forming, requires a material with low water content. The material is placed in a die and then compacted with a steel plunger set at a desired pressure. More regular in shape and sharper in outline than brick made with the other two methods, pressed bricks also feature frogs.

Chamfering the brick

- Chamfering machines were developed to produce a furrow in brick for such applications as paving. These machines use rollers to indent the brick as it is being extruded. They are sometimes equipped with wire cutters to do the chamfering and cutting in one step. Such machines can produce as many as 20,000 units per hour.

Coating

- The choice of sand coating, also applied as the brick is extruded, depends on how soft or hard the extruded material is. A continuous, vibrating feeder is used to coat soft material, whereas for textured material the coating may have to

be brushed or rolled on. For harder materials a pressure roller or compressed air is used, and, for extremely hard materials, sand blasting is required.

Drying

- Before the brick is fired, it must be dried to remove excess moisture. If this moisture is not removed, the water will burn off too quickly during firing, causing cracking. Two types of dryers are used. Tunnel dryers use cars to move the brick through humidity-controlled zones that prevent cracking. They consist of a long chamber through which the ware is slowly pushed. External sources of fan-circulated hot air are forced into the dryer to speed the process.

- Automatic chamber dryers are also used, especially in Europe. The extruded bricks are automatically placed in rows on two parallel bars. The bricks are then fed onto special racks with finger-like devices that hold several pairs of bars in multiple layers. These racks are then transferred by rail-mounted transfer cars or by lift trucks into the dryers.

Firing

- After drying, the brick is loaded onto cars (usually automatically) and fired to high temperatures in furnaces called kilns. In general, the cars that moved the bricks through the drying process are also used to convey them through the tunnel kiln. These cars are pushed through the kiln's continuously maintained temperature zones at a specific rate that depends on the material. The majority of kilns in the United States use gas as a fuel source, though a third of the brick currently produced is fired using solid fuels such as sawdust and coal. Tunnel kilns have changed in design from high-load, narrow-width kilns to shorter, lower-set wider kilns that can fire more brick. This type of design has also led to high-velocity, long-flame, and low-temperature flame burners, which have improved temperature uniformity and lowered fuel consumption.

Setting and packaging

- After the brick is fired and cooled, it is unloaded from the kiln car via the deacking process, which has been automated to the point where almost all manual brickhandling is eliminated. Automated setting machines have been developed that can set brick at rates of over 18, 000 per hour and can rotate the brick 180 degrees. Usually set in rows eleven bricks wide, a stack is wrapped with steel bands and fitted with plastic strips that serve as corner protectors. The packaged brick is then shipped to the job site, where it is typically unloaded using boom trucks.

Quality Control

Though the brick industry is often considered unsophisticated, many manufacturers are participating in total quality management and statistical control programs. The latter involves establishing control limits for a certain process (such as temperature during drying or firing) and tracking the parameter

to make sure the relevant processes are kept within the limits. Therefore, the process can be controlled as it happens, preventing defects and improving yields.

A variety of physical and mechanical properties must be measured and must comply with standards set by the American Society of Testing and Materials (ASTM). These properties include physical dimensions, density, and mechanical strength. Another important property is freeze-thaw durability, where the brick is tested under conditions that are supposed to simulate what is encountered in the outdoors. However, current tests are inadequate and do not really correlate to actual conditions. What passes in the laboratory may not pass in the field. Therefore, the brick industry is trying to develop a more accurate test.

A similar problem exists with a condition known as *efflorescence*, which occurs when water dissolves certain elements (salt is among the most common) in exterior sources, mortar, or the brick itself. The residual deposits of soluble material produce surface discoloration that can be worsened by improper cleaning. When salt deposits become insoluble, the efflorescence worsens, requiring extensive cleaning. Though a brick may pass the laboratory test, it could fail in the field due to improper design or building practices. Therefore, brick companies are developing their own in-house testing procedures, and research is continuing to develop a more reliable standard test.

The Future

Currently, the use of brick has remained steady, at around seven to nine billion a year, down from the 15 billion used annually during the early 1900s. In an effort to increase demand, the brick industry continues to explore alternative markets and to improve quality and productivity. Fuel efficiency has also improved, and by the year 2025 brick manufacturers may even be firing their brick with solar energy. However, such changes in technology will occur only if there is still a demand for brick.

Even if this demand continues, the brick industry both here and abroad faces another challenge: it will soon be forced to comply with environmental regulations, especially in the area of fluorine emissions. Fluorine, a byproduct of the brickmaking process, is a highly reactive element that is dangerous to humans. Long-term exposure can cause kidney and liver damage, digestive problems, and changes in teeth and bones, and the Environmental Protection Agency (EPA) has consequently established maximum exposure limits. To lessen the dangers posed by fluorine emissions, brickworks can install scrubbers, but they are expensive. While some plants have already installed such systems, the U.S. brick industry is trying to play a more important role in developing less expensive emissions testing methods and establishing emission limits. If the brick industry cannot persuade federal regulators to lower their requirements, it is quite possible that the industry could shrink in size, as some companies cannot afford to comply and will go out of business.

Brick

A construction material usually made of clay and extruded or molded as a rectangular block. Three types of clay are used in the manufacture of bricks: surface clay, fire clay, and shale. Adobe brick is a sun-dried molded mix of clay, straw, and water, manufactured mainly in Mexico and some southern regions of the United States. *See also* Clay.

The first step in manufacture is crushing the clay. The clay is then ground, mixed with water, and shaped. Then the bricks are fired in a kiln at approximately 2000°F (1093°C). Substances in the clay such as ferrous, magnesium, and calcium oxides impart color to the bricks during the firing process. The color may be uniform throughout the bricks, or the bricks may be manufactured with a coated face. The latter are classified as glazed, claycoat, or engobe.

The most commonly used brick product is known as facing brick. Decorative bricks molded in special shapes are used to form certain architectural details such as water tables, arches, copings, and corners.

1. A piece of equipment that has been programmed or configured into a *hung*, *wedged*, unusable state. Especially used to describe what happens to devices like routers or PDAs that run from firmware when the firmware image is damaged or its settings are somehow patched to impossible values. This term usually implies irreversibility, but equipment can sometimes be unbricked by performing a hard reset or some other drastic operation. Sometimes verbed: «Yeah, I bricked the router because I forgot about adding in the new access-list».

2. An outboard power transformer of the kind associated with laptops, modems, routers and other small computing appliances, especially one of the modern type with cords on both ends, as opposed to the older and obnoxious type that plug directly into wall or barrier strip.

Brick, ceramic structural material that, in modern times, is made by pressing clay into blocks and firing them to the requisite hardness in a kiln. Bricks in their most primitive form were not fired but were hardened by being dried in the sun. Sun-dried bricks were utilized for many centuries and are used even today in regions with the proper climate. Examples from approximately 5, 000 years ago have been discovered in the Tigris-Euphrates basin, and the ancient races occupying this region may have been the first users of brick. In Babylonia there was a lack of both timber and stone, and the thick clay deposited by the overflowing rivers was the only material adaptable to building. The Persians and the Assyrians used sun-dried blocks of clay for walls of great thickness, facing them with a protective coating of fired bricks. The Egyptians and the Greeks used bricks only to a limited extent, as they had access to plentiful supplies of stone and marble. The Romans manufactured fired bricks in enormous quantities and gave them an important role as a basic structural material in buildings throughout the Roman Empire.

Bricks played an important part in early Christian architecture until the decline of the empire. Whereas the Romans had usually concealed their brickwork beneath a decorative facing of stone or marble, the Byzantines devised a technique for exposing the bricks and giving them a full decorative expression. This technique influenced the Romanesque style and brought especially good results in Lombardy and in Germany, where bricks came to be arranged in immensely varied patterns. Since the Middle Ages, brickwork has been in constant use everywhere, adapting itself to every sort of construction and to every change of architectural style. At the beginning of the 19th cent. mechanical brick-making processes began to be patented and by the latter half of the century had almost entirely replaced the ancient hand-fashioning methods. Contemporary American building bricks are rectangular blocks with the standard dimensions of about $2\frac{1}{4}$ by $3\frac{3}{4}$ by 8 in. (5.7 by 9.5 by 20.3 cm). Good bricks are resistant to atmospheric action and high temperatures and are more durable than stone. Where heat resistance is especially important, fire bricks are used; these are made of special refractory clays called fire clays and are fired at very high temperatures. A **brick** is a block or a single unit of a ceramic material used in masonry construction. Typically bricks are stacked together or laid as brickwork using various kinds of mortar to hold the bricks together and make a permanent structure. Bricks are typically produced in common or standard sizes in bulk quantities. They have been regarded as one of the longest lasting and strongest building materials used throughout history.

In the general sense, a «brick» is a standard-sized weight-bearing building unit. Bricks are laid in horizontal courses, sometimes dry and sometimes with mortar. When the term is used in this sense, the brick might be made from clay, lime-and-sand, concrete, or shaped stone. In a less clinical and more colloquial sense, bricks are made from dried earth, usually from clay-bearing subsoil. In some cases, such as adobe, the brick is merely dried. More commonly it is fired in a kiln of some sort to form a true ceramic.

The oldest domestic bricks were found in Greece. In the 12th century, bricks from Northern-Western Italy were re-introduced to Northern Germany, where an independent tradition evolved. It culminated in the so-called brick Gothic, a reduced style of Gothic architecture that flourished in Northern Europe, especially in the regions around the Baltic Sea, which are without natural rock resources. Brick Gothic buildings, which are built almost exclusively of bricks, are to be found in Denmark, Germany, Poland, and Russia.

During the Renaissance and the Baroque, visible brick walls were unpopular and the brickwork was often covered with plaster. It was only during the mid-18th century that visible brick walls regained some degree of popularity, as illustrated by the Dutch Quarter of Potsdam, for example.

The transport in bulk of building materials such as bricks over long distances was rare before the age of canals, railways, roads and heavy goods

vehicles. Before this time bricks were generally made close to their point of intended use. It has been estimated that in England in the 18th century carrying bricks by horse and cart for ten miles (16 km) over the poor roads then existing could more than double their price.

Bricks were often used for reasons of speed and economy, even in areas where stone was available. The buildings of the Industrial Revolution in Britain were largely constructed of brick and timber due to the demand created. During the building boom of the 19th century in the eastern seaboard cities of Boston and New York City, for example, locally made bricks were often used in construction in preference to the brown stones of New Jersey and Connecticut for these reasons.

The trend of building high office buildings that emerged towards the beginning of the 19th century displaced brick in favor of cast and wrought iron and later steel and concrete. Some early 'skyscrapers' were made in masonry, and demonstrated the limitations of the material – for example, the Monadnock Building in Chicago (opened in 1896) is masonry and just 17 stories high; the ground walls are almost 6 feet (1.8 m) thick to give the needed support; clearly building any higher would lead to excessive loss of internal floor space on the lower floors. Brick was revived for high structures in the 1950s following work by the Swiss Federal Institute of Technology and the Building Research Establishment in Watford, UK. This method produced 18-story structures with load-bearing walls no thicker than a single brick (150–225 mm). This potential has not been fully developed because of the ease and speed in building with other materials; in the late-20th century brick was confined to low- or medium-rise structures or as a thin decorative cladding over concrete-and-steel buildings or for internal non-load-bearing walls. In Victorian London, bright red brick was chosen to make buildings more visible in the heavy fog that caused transport problems.

Bull's Trench Kilns

In India, brick making is typically a manual process. The most common type of brick kiln in use there is the **Bull's Trench Kiln** (BTK), based on a design developed by British engineer W. Bull in the late 19th century.

An oval or circular trench is dug, 6–9 metres wide, 2–2.5 metres deep, and 100–150 metres in circumference. A tall exhaust chimney is constructed in the centre. Half or more of the trench is filled with «green» (unfired) bricks which are stacked in an open lattice pattern to allow airflow. The lattice is capped with a roofing layer of finished brick.

In operation, new green bricks, along with roofing bricks, are stacked at one end of the brick pile; cooled finished bricks are removed from the other end for transport to their destinations. In the middle, the brick workers create a firing

zone by dropping fuel (coal, wood, oil, debris, and so on) through access holes in the roof above the trench.

The advantage of the BTK design is a much greater energy efficiency compared with clamp or scove kilns. Sheet metal or boards are used to route the airflow through the brick lattice so that fresh air flows first through the recently burned bricks, heating the air, then through the active burning zone. The air continues through the green brick zone (pre-heating and drying the bricks), and finally out the chimney, where the rising gases create suction which pulls air through the system. The reuse of heated air yields savings in fuel cost.

As with the rail process above, the BTK process is continuous. A half dozen laborers working around the clock can fire approximately 15,000–25,000 bricks a day. Unlike the rail process, in the BTK process the bricks do not move. Instead, the locations at which the bricks are loaded, fired, and unloaded gradually rotate through the trench.

Extruded bricks

For extruded bricks the clay is mixed with 10–15 % water (stiff extrusion) or 20–25 % water (soft extrusion). This mixture is forced through a die to create a long cable of material of the desired width and depth. This mass is then cut into bricks of the desired length by a wall of wires. Most structural bricks are made by this method as it produces hard, dense bricks, and suitable dies can produce holes or other perforations as well. The introduction of such holes reduces the volume of clay needed, and hence the cost. Hollow bricks are lighter and easier to handle, and have thermal different properties than solid bricks. The cut bricks are hardened by drying for 20 to 40 hours at 50 to 150 °C before being fired. The heat for drying is often waste heat from the kiln.

European-style extruded bricks or blocks are used in single-wall construction with finishes applied on the inside and outside. Their many voids comprise a greater proportion of the volume than the solid, thin walls of fired clay. Such bricks are made in 15-, 25-, 30-, 42- and 50-cm widths. Some models have very high thermal insulation properties, making them suitable for zero-energy buildings.

Calcium-Silicate bricks

The raw materials for calcium-silicate bricks include lime mixed with quartz, crushed flint or crushed siliceous rock together with mineral colourants. The materials are mixed and left until the lime is completely hydrated; the mixture is then pressed into moulds and cured in an autoclave for two or three hours to speed the chemical hardening. The finished bricks are very accurate and uniform, although the sharp arrises need careful handling to avoid damage to brick (and bricklayer). The bricks can be made in a variety of colours; white is common but pastel shades can be achieved.

This type of brick is common in Sweden, especially in houses built or renovated in the 1970s, where it is known as «Mexitegel» (en: Mexican Bricks).

In India these are known as Fly ash bricks, manufactured using the FaL-G (fly ash, lime and gypsum) process.

Calcium-silicate bricks are also manufactured in Canada and the United States, and meet the criteria set forth in ASTM C73 – 10 Standard Specification for Calcium Silicate Brick (Sand-Lime Brick). It has lower embodied energy than cement based man-made stone and clay brick.

Influence on fired colour

The fired colour of clay bricks is influenced by the chemical and mineral content of the raw materials, the firing temperature, and the atmosphere in the kiln. For example, pink coloured bricks are the result of a high iron content, white or yellow bricks have a higher lime content. Most bricks burn to various red hues; as the temperature is increased the colour moves through dark red, purple and then to brown or grey at around 1,300 °C (2,372 °F). Calcium silicate bricks have a wider range of shades and colours, depending on the colourants used. The names of bricks may reflect their origin and colour, such as London stock brick and Cambridgeshire White.

«Bricks» formed from concrete are usually termed blocks, and are typically pale grey in colour. They are made from a dry, small aggregate concrete which is formed in steel moulds by vibration and compaction in either an «egg layer» or static machine. The finished blocks are cured rather than fired using low-pressure steam. Concrete blocks are manufactured in a much wider range of shapes and sizes than clay bricks and are also available with a wider range of face treatments – a number of which simulate the appearance of clay bricks.

An impervious and ornamental surface may be laid on brick either by salt glazing, in which salt is added during the burning process, or by the use of a «slip», which is a glaze material into which the bricks are dipped. Subsequent reheating in the kiln fuses the slip into a glazed surface integral with the brick base.

Natural stone bricks are of limited modern utility due to their enormous comparative mass, the consequent foundation needs, and the time-consuming and skilled labour needed in their construction and laying. They are very durable and considered more handsome than clay bricks by some. Only a few stones are suitable for bricks. Common materials are granite, limestone and sandstone. Other stones may be used (for example, marble, slate, quartzite, and so on) but these tend to be limited to a particular locality.

Loose bricks

For efficient handling and laying, bricks must be small enough and light enough to be picked up by the bricklayer using one hand (leaving the other hand

free for the trowel). Bricks are usually laid flat and as a result the effective limit on the width of a brick is set by the distance which can conveniently be spanned between the thumb and fingers of one hand, normally about four inches (about 100 mm). In most cases, the length of a brick is about twice its width, about eight inches (about 200 mm) or slightly more. This allows bricks to be laid *bonded* in a structure which increases stability and strength (for an example, see the illustration of bricks laid in *English bond*, at the head of this article). The wall is built using alternating courses of *stretchers*, bricks laid longways, and *headers*, bricks laid crossways. The headers tie the wall together over its width. In fact, this wall is built in a variation of *English bond* called *English cross bond* where the successive layers of stretchers are displaced horizontally from each other by half a brick length. In true *English bond* the perpendicular lines of the stretcher courses are in line with each other.

A bigger brick makes for a thicker (and thus more insulating) wall. Historically, this meant that bigger bricks were necessary in colder climates, while a smaller brick was adequate, and more economical, in warmer regions. A notable illustration of this correlation is the Green Gate in Gdansk; built in 1571 of imported Dutch brick, too small for the colder climate of Gdansk, it was notorious for being a chilly and drafty residence. Nowadays this is no longer an issue, as modern walls typically incorporate specialized insulation materials.

The correct brick for a job can be selected from a choice of colour, surface texture, density, weight, absorption and pore structure, thermal characteristics, thermal and moisture movement, and fire resistance.

Bricks may also be classified as *solid* (less than 25 % perforations by volume, although the brick may be «frogged», having indentations on one of the longer faces), *perforated* (containing a pattern of small holes through the brick, removing no more than 25 % of the volume), *cellular* (containing a pattern of holes removing more than 20 % of the volume, but closed on one face), or *hollow* (containing a pattern of large holes removing more than 25 % of the brick's volume). Blocks may be solid, cellular or hollow.

The term «frog» for the indentation on one bed of the brick is a word that often excites curiosity as to its origin. The most likely explanation is that brickmakers also call the block that is placed in the mould to form the indentation a frog. Modern brickmakers usually use plastic frogs but in the past they were made of wood. When these are wet and have clay on them they resemble the amphibious kind of frog and this is where they got their name. Over time this term also came to refer to the indentation left by them.

Use

Bricks are used for building, block paving and pavement. In the USA, brick pavement was found incapable of withstanding heavy traffic, but it is coming back into use as a method of traffic calming or as a decorative surface in

pedestrian precincts. For example, in the early 1900s, most of the streets in the city of Grand Rapids, Michigan were paved with brick. Today, there are only about 20 blocks of brick paved streets remaining (totalling less than 0.5 percent of all the streets in the city limits).

Bricks in the metallurgy and glass industries are often used for lining furnaces, in particular refractory bricks such as silica, magnesia, chamotte and neutral (chromomagnesite) refractory bricks. This type of brick must have good thermal shock resistance, refractoriness under load, high melting point, and satisfactory porosity. There is a large refractory brick industry, especially in the United Kingdom, Japan, the United States, Belgium and the Netherlands.

In Northwest Europe, bricks have been used in construction for centuries. Until recently, almost all houses were built almost entirely from bricks. Although many houses are now built using a mixture of concrete blocks and other materials, many houses are skinned with a layer of bricks on the outside for aesthetic appeal.

Engineering bricks are used where strength, low water porosity or acid (flue gas) resistance are needed.

In the UK a redbrick university is one founded and built in the Victorian era, often as a technical college. The term serves to distinguish these polytechnic colleges from older, more classics-oriented universities.

Colombian architect Rogelio Salmona was noted for his extensive use of red brick in his buildings and for using natural shapes like spirals, radial geometry and curves in his designs. Most buildings in Colombia are made of brick, given the abundance of clay in equatorial countries like this one.

TEXT 6

Задание 1. Прочитайте текст, стараясь понять его общее содержание.

Задание 2. Выполните полный письменный перевод текста. Объясните, какие переводческие трансформации вы используете.

Management in all business and organizational activities is the act of getting people together to accomplish desired goals and objectives using available resources efficiently and effectively. Management comprises planning, organizing, staffing, leading or directing, and controlling an organization (a group of one or more people or entities) or effort for the purpose of accomplishing a goal. Resourcing encompasses the deployment and manipulation of human resources, financial resources, technological resources, and natural resources.

Since organizations can be viewed as systems, management can also be defined as human action, including design, to facilitate the production of useful

outcomes from a system. This view opens the opportunity to 'manage' oneself, a prerequisite to attempting to manage others.

History

The verb *manage* comes from the Italian *maneggiare* (to handle, especially tools), which derives from the Latin word *manus* (hand). The French word *mesnagement* (later *ménagement*) influenced the development in meaning of the English word *management* in the 17th and 18th centuries.

Some definitions of management are:

- Organization and coordination of the activities of an enterprise in accordance with certain policies and in achievement of clearly defined objectives. Management is often included as a factor of production along with machines, materials and money. According to Peter Drucker (1909–2005), the basic task of a management is twofold: marketing and innovation. Nevertheless, innovation is also linked to marketing (product innovation is a central strategic marketing issue). Peter Drucker identifies Marketing as a key essence for business success, but management and marketing are generally understood as two different branches of business administration knowledge.

- Directors and managers have the power and responsibility to make decisions to manage an enterprise when given the authority by the shareholders. As a discipline, management comprises the interlocking functions of formulating corporate policy and organizing, planning, controlling, and directing the firm's resources to achieve the policy's objectives. The size of management can range from one person in a small firm to hundreds or thousands of managers in multinational companies. In large firms, the board of directors formulates the policy that the chief executive officer implements.

Theoretical scope

At first, one views management functionally, such as measuring quantity, adjusting plans, meeting goals. This applies even in situations where planning does not take place. From this perspective, Henri Fayol (1841–1925) considers management to consist of six functions: forecasting, planning, organizing, commanding, coordinating and controlling. He was one of the most influential contributors to modern concepts of management.

Another way of thinking, Mary Parker Follett (1868–1933), defined management as «the art of getting things done through people». She described management as philosophy.

Some people, however, find this definition useful but far too narrow. The phrase «management is what managers do» occurs widely, suggesting the difficulty of defining management, the shifting nature of definitions and the connection of managerial practices with the existence of a managerial cadre or class.

One habit of thought regards management as equivalent to «business administration» and thus excludes management in places outside commerce, as for example in charities and in the public sector. More realistically, however, every organization must manage its work, people, processes, technology, etc. to maximize effectiveness. Nonetheless, many people refer to university departments that teach management as «business schools». Some institutions (such as the Harvard Business School) use that name while others (such as the Yale School of Management) employ the more inclusive term «management».

English speakers may also use the term «management» or «the management» as a collective word describing the managers of an organization, for example of a corporation. Historically this use of the term was often contrasted with the term «Labor» referring to those being managed.

Nature of managerial work

In for-profit work, management has as its primary function the satisfaction of a range of stakeholders. This typically involves making a profit (for the shareholders), creating valued products at a reasonable cost (for customers), and providing rewarding employment opportunities for employees. In nonprofit management, add the importance of keeping the faith of donors. In most models of management and governance, shareholders vote for the board of directors, and the board then hires senior management. Some organizations have experimented with other methods (such as employee-voting models) of selecting or reviewing managers, but this is rare.

In the public sector of countries constituted as representative democracies, voters elect politicians to public office. Such politicians hire many managers and administrators, and in some countries like the United States political appointees lose their jobs on the election of a new president/governor/mayor.

Historical development

Difficulties arise in tracing the history of management. Some see it (by definition) as a late modern (in the sense of late modernity) conceptualization. On those terms it cannot have a pre-modern history, only harbingers (such as stewards). Others, however, detect management-like-thought back to Sumerian traders and to the builders of the pyramids of ancient Egypt. Slave-owners through the centuries faced the problems of exploiting/motivating a dependent but sometimes unenthusiastic or recalcitrant workforce, but many pre-industrial enterprises, given their small scale, did not feel compelled to face the issues of management systematically. However, innovations such as the spread of Arabic numerals (5th to 15th centuries) and the codification of double-entry book-keeping (1494) provided tools for management assessment, planning and control.

Given the scale of most commercial operations and the lack of mechanized record-keeping and recording before the industrial revolution, it made sense for most owners of enterprises in those times to carry out management functions by and for themselves. But with growing size and complexity of organizations, the split between owners (individuals, industrial dynasties or groups of shareholders) and day-to-day managers (independent specialists in planning and control) gradually became more common.

Early writing

While management has been present for millennia, several writers have created a background of works that assisted in modern management theories.

Some ancient military texts have been cited for lessons that civilian managers can gather. For example, Chinese general Sun Tzu in the 6th century BC, *The Art of War*, recommends being aware of and acting on strengths and weaknesses of both a manager's organization and a foe's.

Various ancient and medieval civilizations have produced «mirrors for princes» books, which aim to advise new monarchs on how to govern. Examples include the Indian Arthashastra by Chanakya (written around 300BC), and *The Prince* by Italian author Niccolò Machiavelli (c. 1515).

Further information: Mirrors for princes

19th century

Classical economists such as Adam Smith (1723–1790) and John Stuart Mill (1806–1873) provided a theoretical background to resource-allocation, production, and pricing issues. About the same time, innovators like Eli Whitney (1765–1825), James Watt (1736–1819), and Matthew Boulton (1728–1809) developed elements of technical production such as standardization, quality-control procedures, cost-accounting, interchangeability of parts, and work-planning. Many of these aspects of management existed in the pre-1861 slave-based sector of the US economy. That environment saw 4 million people, as the contemporary usages had it, «managed» in profitable quasi-mass production.

Written in 1776 by Adam Smith, a Scottish moral philosopher, *The Wealth of Nations* aims for efficient organization of work through Specialization of labor. Smith described how changes in processes could boost productivity in the manufacture of pins. While individuals could produce 200 pins per day, Smith analyzed the steps involved in manufacture and, with 10 specialists, enabled production of 48, 000 pins per day.

20th century

By about 1900 one finds managers trying to place their theories on what they regarded as a thoroughly scientific basis (see scientism for perceived limitations of this belief). Examples include Henry R. Towne's *Science of*

management in the 1890s, Frederick Winslow Taylor's *The Principles of Scientific Management* (1911), Frank and Lillian Gilbreth's *Applied motion study* (1917), and Henry L. Gantt's charts (1910s). J.Duncan wrote the first college management textbook in 1911. In 1912 Yoichi Ueno introduced Taylorism to Japan and became first management consultant of the «Japanese-management style». His son Ichiro Ueno pioneered Japanese quality assurance.

The first comprehensive theories of management appeared around 1920. The Harvard Business School offered the first Master of Business Administration degree (MBA) in 1921. People like Henri Fayol (1841–1925) and Alexander Church described the various branches of management and their inter-relationships. In the early 20th century, people like Ordway Tead (1891–1973), Walter Scott and J. Mooney applied the principles of psychology to management, while other writers, such as Elton Mayo (1880–1949), Mary Parker Follett (1868–1933), Chester Barnard (1886–1961), Max Weber (1864–1920), Rensis Likert (1903–1981), and Chris Argyris (1923 –) approached the phenomenon of management from a sociological perspective.

Peter Drucker (1909–2005) wrote one of the earliest books on applied management: *Concept of the Corporation* (published in 1946). It resulted from Alfred Sloan (chairman of General Motors until 1956) commissioning a study of the organisation. Drucker went on to write 39 books, many in the same vein.

H. Dodge, Ronald Fisher (1890–1962), and Thornton C. Fry introduced statistical techniques into management-studies. In the 1940s, Patrick Blackett worked in the development of the applied mathematics science of operations research, initially for military operations. Operations research, sometimes known as «management science» (but distinct from Taylor's scientific management), attempts to take a scientific approach to solving decision problems, and can be directly applied to multiple management problems, particularly in the areas of logistics and operations.

Some of the more recent developments include the Theory of Constraints, management by objectives, reengineering, Six Sigma and various information-technology-driven theories such as agile software development, as well as group management theories such as Cog's Ladder.

As the general recognition of managers as a class solidified during the 20th century and gave perceived practitioners of the art/science of management a certain amount of prestige, so the way opened for popularised systems of management ideas to peddle their wares. In this context many management fads may have had more to do with pop psychology than with scientific theories of management.

Towards the end of the 20th century, business management came to consist of six separate branches, namely:

- Human resource management
- Operations management or production management

- Strategic management
- Marketing management
- Financial management
- Information technology management responsible for management information systems

21st century

In the 21st century observers find it increasingly difficult to subdivide management into functional categories in this way. More and more processes simultaneously involve several categories. Instead, one tends to think in terms of the various processes, tasks, and objects subject to management.

Branches of management theory also exist relating to nonprofits and to government: such as public administration, public management, and educational management. Further, management programs related to civil-society organizations have also spawned programs in nonprofit management and social entrepreneurship.

Note that many of the assumptions made by management have come under attack from business ethics viewpoints, critical management studies, and anti-corporate activism.

As one consequence, workplace democracy has become both more common, and more advocated, in some places distributing all management functions among the workers, each of whom takes on a portion of the work. However, these models predate any current political issue, and may occur more naturally than does a command hierarchy. All management embraces some degree democratic principle – in that in the long term, the majority of workers must support management. Otherwise, they leave to find other work or go on strike. Despite the move toward workplace democracy, command-and-control organization structures remain commonplace as *de facto* organization structure. Indeed, the entrenched nature of command-and-control is evident in the way that recent layoffs have been conducted with management ranks affected far less than employees at the lower levels. In some cases, management has even rewarded itself with bonuses after laying off lower level workers.

According to leadership academic Manfred F.R. Kets de Vries, it's almost inevitable these days that a senior management team have some personality disorders.

Topics

Basic functions

Management operates through various functions, often classified as planning, organizing, staffing, leading/directing, controlling/monitoring and motivation.

- **Planning:** Deciding what needs to happen in the future (today, next week, next month, next year, over the next five years, etc.) and generating plans for action.

- **Organizing:** (Implementation) pattern of relationships among workers, making optimum use of the resources required to enable the successful carrying out of plans.

- **Staffing:** Job analysis, recruitment and hiring for appropriate jobs.

- **Leading/directing:** Determining what must be done in a situation and getting people to do it.

- **Controlling/monitoring:** Checking progress against plans.

- **Motivation:** Motivation is also a kind of basic function of management, because without motivation, employees cannot work effectively. If motivation does not take place in an organization, then employees may not contribute to the other functions (which are usually set by top-level management).

Basic roles

- **Interpersonal:** roles that involve coordination and interaction with employees

- **Informational:** roles that involve handling, sharing, and analyzing information

- **Decisional:** roles that require decision-making

- **Management skills**

- **Political:** used to build a power base and establish connections

- **Conceptual:** used to analyze complex situations.

- **Interpersonal:** used to communicate, motivate, mentor and delegate

- **Diagnostic:** ability to visualize most appropriate response to a situation

- **Technical:** Expertise in one's particular functional area.

Formation of the business policy

- The mission of the business is the most obvious purpose—which may be, for example, to make soap.

- The vision of the business reflects its aspirations and specifies its intended direction or future destination.

- The objectives of the business refers to the ends or activity that is the goal of a certain task.

- The business's policy is a guide that stipulates rules, regulations and objectives, and may be used in the managers' decision-making. It must be flexible and easily interpreted and understood by all employees.

- The business's strategy refers to the coordinated plan of action it takes and resources it uses to realize its vision and long-term objectives. It is a guideline to managers, stipulating how they ought to allocate and use the factors of

production to the business's advantage. Initially, it could help the managers decide on what type of business they want to form.

Implementation of policies and strategies

- All policies and strategies must be discussed with all managerial personnel and staff.

- Managers must understand where and how they can implement their policies and strategies.

- A plan of action must be devised for each department.

- Policies and strategies must be reviewed regularly.

- Contingency plans must be devised in case the environment changes.

- Top-level managers should carry out regular progress assessments.

- The business requires team spirit and a good environment.

- The missions, objectives, strengths and weaknesses of each department must be analysed to determine their roles in achieving the business's mission.

- The forecasting method develops a reliable picture of the business's future environment.

- A planning unit must be created to ensure that all plans are consistent and that policies and strategies are aimed at achieving the same mission and objectives.

All policies must be discussed with all managerial personnel and staff that is required in the execution of any departmental policy.

- Organizational change is strategically achieved through the implementation of the eight-step plan of action established by John P. Kotter: Increase urgency, get the vision right, communicate the buy-in, empower action, create short-term wins, don't let up, and make change stick.

Policies and strategies in the planning process

- They give mid and lower-level managers a good idea of the future plans for each department in an organization.

- A framework is created whereby plans and decisions are made.

- Mid and lower-level management may add their own plans to the business's strategies.

Levels of management

Most organizations have three management levels: first-level, middle-level, and top-level managers. These managers are classified in a hierarchy of authority, and perform different tasks. In many organizations, the number of managers in every level resembles a pyramid. Each level is explained below in specifications of their different responsibilities and likely job titles.

Top-level managers

Consists of board of directors, president, vice-president, CEOs, etc. They are responsible for controlling and overseeing the entire organization. They develop goals, strategic plans, company policies, and make decisions on the direction of the business. In addition, top-level managers play a significant role in the mobilization of outside resources and are accountable to the shareholders and general public.

According to Lawrence S. Kleiman, the following skills are needed at the top managerial level.

- Broadened understanding of how: competition, world economies, politics, and social trends effect organizational effectiveness .

Top management's role is:

- Lay down the objectives and broad policies of the enterprise.
- Issues necessary instructions for preparation of department budgets, procedures, schedules, etc.
- Prepares strategic plans and policies for the enterprise.
- Appoint middle level executives, i.e., departmental managers.
- Controls and coordinate activities of all departments.
- Maintain contact with the outside world.
- Provides guidance and direction.
- Answer to shareholders for the performance of the enterprise.

Middle-level managers

Consist of general managers, branch managers and department managers. They are accountable to the top management for their department's function. They devote more time to organizational and directional functions. Their roles can be emphasized as executing organizational plans in conformance with the company's policies and the objectives of the top management, they define and discuss information and policies from top management to lower management, and most importantly they inspire and provide guidance to lower level managers towards better performance. Their functions include:

- Design and implement effective group and inter-group work and information systems.
- Define and monitor group-level performance indicators.
- Diagnose and resolve problems within and among work groups.
- Design and implement reward systems that support cooperative behavior.

First-level managers

Consist of supervisors, section leads, foremen, etc. They focus on controlling and directing. They usually have the responsibility of assigning employees tasks, guiding and supervising employees on day-to-day activities, ensuring quality and quantity production, making recommendations,

suggestions, and upchanneling employee problems, etc. First-level managers are role models for employees that provide:

- Basic supervision
- Motivation
- Career planning
- Performance feedback

TEXT 7

Задание 1. Прочитайте текст, стараясь понять его общее содержание.

Задание 2. Выполните полный письменный перевод текста. Объясните, какие переводческие трансформации вы используете.

Economics

General Characteristics

Economics studies human welfare in terms of the production, distribution, and consumption of goods and services. While there is a considerable body of ancient and medieval thought on economic questions, the discipline of political economy only took shape in the early modern period. Some prominent schools of the seventeenth and eighteenth centuries were Cameralism (Germany), Mercantilism (Britain), and Physiocracy (France). Classical political economy, launched by Adam Smith's *Wealth of Nations* (1776), dominated the discipline for more than one hundred years. American economics drew on all of these sources, but it did not forge its own identity until the end of the nineteenth century, and it did not attain its current global hegemony until after World War II. This was as much due to the sheer number of active economists as to the brilliance of Paul Samuelson, Milton Friedman, and Kenneth Arrow, among others. Prior to 1900, the American community of economists had largely been perceived, both from within and from abroad, as a relative backwater. The United States did not produce a theorist to rival the likes of Adam Smith (1723–1790), David Ricardo (1772–1823), or Karl Marx (1818–1883).

Several factors in American economic and intellectual history help explain this fact. First, the presence of a large slave economy before the Civil War resulted in a concentrated effort to weigh the arguments for and against free labor. The landmark study in American economic history of the last century, Robert Fogel and Stanley Engerman's *Time on the Cross* (1974), speaks to this unfortunate legacy. Second, the belated onset of industrialization (in 1860, 80 percent of the population was still rural), and the founding of many land-grant colleges with the Morrill Act of 1862 resulted in the emergence of a field of specialization that endures to this day: agricultural or land economics. Even in the interwar years, the Bureau of Agricultural Economics was a major center of research in the field. Third, American federalism, by decentralizing the

management of money and credit, had direct and arguably dire consequences for the development of banking and capital accumulation. Persistent debates on the merits of paper currency can be traced from the latter half of the eighteenth century right up to 1971, when American fiat money replaced the gold standard once and for all.

The relatively high standard of living and the massive wave of immigration during the latter part of the nineteenth century might also have played a part in the diminished role of socialist thinking. A liberal ideology coupled with the absence of an aristocracy meant that socialism never became as rooted in America as in Europe. In the few instances that it did, it tended to be of the more innocuous variety, such as Robert Owen's (1771–1858) 1825 settlement of New Harmony, Indiana, or Richard T. Ely's (1854–1943) Christian socialism. The most popular reform movement in late-nineteenth-century economics was inspired by Henry George's (1839–1897) *Progress and Poverty* (1879), which argued for a single tax on land. Economic theory tended then as now toward liberalism if not libertarianism, with its deeply entrenched respect for individual rights, market forces, and the diminished role of the government.

What probably most explains the form and content of American economics is its resistance to the influence of other disciplines. Because of the sheer size of the economics profession (there are some 22,000 registered members of the American Economic Association, and that by no means exhausts the number), it tends to be very inward-looking. Not since before World War II have economists eagerly borrowed from the other sciences. Even prewar economists were more likely to assimilate concepts and methods from physics and biology than from sociology or psychology. Instead, «economic imperialists» such as Gary Becker take topics that have traditionally been in other social sciences, such as voting, crime, marriage, and the family, and model them in terms of utility maximization.

The Colonial and Antebellum Period

In colonial America, most contributors to economics, such as Thomas Pownall (1722–1805), governor of Massachusetts, and Samuel Gale (1747–1826) were inspired by the British economists John Locke (1632–1704), David Hume (1711–1776), and Adam Smith. Benjamin Franklin (1706–1790) befriended both the British and French political economists of the time. Because of the shortage of American money, Franklin advocated the circulation of paper money as a stimulus to trade, and he even convinced Hume and Smith of the relative soundness of paper issue in Pennsylvania. Although Franklin wrote on the importance of the development of manufacturing for the American economy, he believed, as would Thomas Paine (1737–1809) and Thomas Jefferson (1743–1826), that the true destiny for America lay with agriculture.

The American republic called for concrete measures on money and banking, as well as policies on trade and manufacturing. In the early years of the new regime, Jefferson and Alexander Hamilton (1757–1804) loomed large as forgers of economic ideas and policy. Jefferson was a friend of Pierre Samuel du Pont de Nemours (1739–1817), Destutt de Tracy (1754–1836), and Jean-Baptiste Say (1767–1832), and he supervised the translation of Tracy's *Treatise on Political Economy* (1817). In a series of tracts, he argued that commerce ought to remain a handmaiden to agriculture, and he took seriously Hume's caveats about public debt. Hamilton, by contrast, advocated the growth of commerce and manufacturing. He sought means to improve the mobility of capital as a stimulus to trade, and with his *National Bank Act and Report on Manufactures* (1791), he went very much against Jefferson's policies.

In antebellum United States we find dozens of contributors to political economy, notably Jacob Cardozo (1786–1873), Daniel Raymond (1786–1849), Francis Wayland (1790–1865), Henry C. Carey (1793–1879), Amasa Walker (1799–1875), and Charles Dunbar (1830–1900). Many of these tailored their analyses to the American context of unlimited land and scarcity of labor. Malthusian scenarios held little sway. The two most prominent European writers in America, both adherents to Smith, were Say, whose *Treatise on Political Economy* was widely read and circulated after its first translation in 1821, and John Ramsey McCulloch (1789–1864). Jane Marcet's (1769–1858) *Conversations on Political Economy* (1816) sold in the thousands, thereby disseminating some of the more central principles of British and French political economy to the inquiring American. The prominent German economist of the period, Friedrich List (1789–1846), first made his name while living in the United States; his *Outlines of American Political Economy* (1827) helped sustain the enthusiasm for protective tariffs. Carey is usually viewed as the most original American-born thinker of the period, and the first to gain an international reputation. His three-volume *Principles of Political Economy* (1837) did much to challenge Ricardo's doctrine of rent, as well as propel him into a significant role as economic advisor to the government in Washington.

The Gilded Age (1870–1914)

Homegrown economic theorists became much more common in this period, spurred into controversies over banking and trade and the onset of large monopolies. The most prominent measure taken in this period, the Sherman Antitrust Act (1890), was not received enthusiastically by the more conservative economists such as Arthur Hadley (1856–1930) because it violated the central principle of laissez-faire. But others, such as Ely, saw the Act as a necessary measure.

Steps were also taken to professionalize, with the formation of the American Economics Association (1885) and the *Quarterly Journal of Economics* (1887).

Two more journals of high quality were formed in this period, the *Journal of Political Economy* (1892) and the *American Economic Review* (1911). Economics also made its way into the universities. Before the Civil War, numerous colleges taught the subject under the more general rubric of moral philosophy, or even theology. But explicit recognition first came with the appointment of Charles Dunbar to the chair of political economy at Harvard in 1871. The prolific economist and son of Amasa, Francis A. Walker (1840–1897) gained a chair at Yale in 1872 and then served as president of MIT in the 1880s and 1890s. By 1900, hundreds of institutions were offering graduate degrees in economics, though the majority of doctorates came from a small set of universities, notably Chicago, Columbia, California, Harvard, and Johns Hopkins. The expansion of institutions of higher learning in this period served to reinforce the propensity to specialize within the field. While the economics profession mostly honors its contributors to pure theory, the majority of doctorates in American economics are and have been granted in applied fields, notably labor, land, business, and industrial economics.

In the area of theoretical economics, the names of Simon Newcomb (1835–1909), Irving Fisher (1867–1947), and John Bates Clark stand out. Newcomb was better known for his work in astronomy and coastal surveying, but his *Principles of Political Economy* (1886) did much to endorse the advent of mathematical methods. Fisher was without question the most renowned and brilliant of his generation of economic theorists. As a doctoral student at Yale, Fisher worked with the eminent physicist J. Willard Gibbs (1839–1903) and the social Darwinist William Graham Sumner (1840–1910). His first book, *Mathematical Investigations in the Theory of Value and Prices* (1892), was a significant landmark in the rise of mathematical economics, and it treated the utility calculus in terms of thermodynamics. His later efforts, *The Purchasing Power of Money* (1911) and *The Theory of Interest* (1930) became two of the most significant works of the twentieth century. The Fisher Equation is still taken to be the best rendition of the quantity theory of money, noted for its efforts to distinguish different kinds of liquidity and to measure the velocity of money.

Clark reigned at Columbia for much of his career, and he is most noted for his analysis of the concept of marginal productivity as an explanation of factor prices, wages, interest, and rent. His *Philosophy of Wealth* (1886) and *Distribution of Wealth* (1899) blended the new marginalism with sociological and ethical concerns. Clark earned international renown for his concept of marginal productivity and helped inspire the next generation of American marginalists, notably Frank Taussig (1859–1940) at Harvard, Frank Fetter (1863–1949) at Princeton, and Laurence Laughlin (1871–1933) at Chicago.

Although the contributions of Fisher and Clark were more enduring, the school that was most distinctively American from approximately 1890 to 1940

was the one known during the interwar years as Institutionalism. The most prominent founders were Ely, Veblen, Mitchell, and John R. Commons (1862–1945). Later contributors included the son of John Bates, John Maurice Clark (1884–1963), and Clarence E. Ayres (1891–1972), but there were many more foot soldiers marching to the cause. Inspired by evolutionary biology, the Institutionalists took a historical, antiformalist approach to the study of economic phenomena. Veblen's *Theory of the Leisure Class* (1899), the most enduring text of this group, examines consumption patterns in terms of biological traits, evolving in step with other institutions—political and pecuniary. Commons focused on labor economics and helped devise many of the measures, such as workmen's compensation, public utility regulations, and unemployment insurance, that resulted in the social security legislation of the 1930s.

Interwar Years 1919–1939

American economics was invigorated by the war and benefited enormously from a wave of immigration from Europe's intelligentsia. Of the three most prominent grand theorists of the period, and arguably of the entire century, namely John Maynard Keynes (1883–1946), Joseph Schumpeter (1883–1950), and Friedrich Hayek (1899–1992), the latter two came and settled in the United States: Schumpeter to Harvard (1932–1950), and Hayek to New York (1923–1924) and later to Chicago (1950–1962). Both did most of their critical work while in Europe, but were part of a larger migration of the Austrian school of economics, notably Ludwig von Mises (1881–1973), Fritz Machlup (1902–1983), and Karl Menger (1902–1985). Other prominent immigrants from Europe were Abraham Wald (1902–1950), John Harsanyi (1920–2000), Tjalling Koopmans (1910–1985), Oskar Lange (1904–1965), Wassily Leontief (1906–1999), Jacob Marschak (1898–1977), John von Neumann (1903–1957), Oskar Morgenstern (1902–1977), Franco Modigliani, Ronald Coase, and Kenneth Boulding (1910–1993).

Notwithstanding the inestimable stimulation of foreign-trained economists, the most prominent figures of this period were American born and educated, notably Fisher, Mitchell, Frank Knight (1885–1972), Henry Ludwell Moore (1869–1958), and Edward Chamberlain (1899–1967). Chamberlain's landmark study, *The Theory of Monopolistic Competition* (1933), contributed to the recognition of the mixed economy of mature capitalism. Fisher's *The Making of Index Numbers* (1922) made important headway on the measurement of key economic indicators. Mitchell stood out as the one who blended a still vibrant community of Institutionalism with the more ascendant neoclassicism. He and Moore's studies of business cycles helped foster the growth of econometrics, resulting in the formation of the National Bureau of Economic Research (1920) and the Cowles Commission (1932), which proved to be an important spawning ground for econometrics and, more generally, mathematical economics. Some

leading economists associated with the Cowles Commission are Fisher, Koopmans, Marschak, Lange, Arrow, Gérard Debreu, James Tobin (1918–2002), and Simon Kuznets (1901–1985).

Knight's *Risk, Uncertainty and Profit* (1921) remains a classic in the study of capital theory and the role of the entrepreneur. Together with Currie, Jacob Viner (1892–1970), and Henry Simons (1899–1946), Knight helped to push the economics department of the University of Chicago into the top rank. With the subsequent contributions of George Stigler (1911–1991), Hayek, and Friedman, Chicago became the leading voice of the status quo. Among Nobel prizewinners in economics, roughly one-half have at some point in their career been associated with the «Chicago School».

Postwar Era

Here we see the clear ascendancy of mathematical economics as the dominant professional orientation. Economists shifted away from the literary pursuit of laws and general principles that characterized nineteenth-century political economy, in favor of models and econometric tests disseminated in the periodical literature. The number of U.S. journals began to surge in the postwar years to 300 by the year 2002, and the number of articles has grown almost exponentially.

No one stands out more prominently in the 1950s to 1960s than Paul Samuelson, not least because of his best selling textbook, *Principles of Economics* (1948). His precocity for mathematics resulted in a series of papers, which were immediately acclaimed for their brilliance. Published as *The Foundations of Economic Analysis* (1947), Samuelson's opus contributed to almost every branch of microeconomics. He devised a solution to the longstanding problem of price dynamics and formulated the axiom of revealed preference, which stands at the very core of neoclassical theory.

Other major contributors to mathematical economics, starting from the interwar period, were Wald on decision theory, Koopmans on linear programming, Leontief on input-output analysis, L. J. Savage (1917–1971) on mathematical statistics, and Harold Hotelling (1895–1973) and Henry Schultz (1893–1938) on demand theory. Arrow and Debreu, who moved to the States in 1949, devised through a series of papers in the 1950s an axiomatic rendition of the general theory of equilibrium – the doctrine by which prices bring about market clearance. In many respects, this put a capstone on the neoclassical theory that had commenced in the 1870s.

Arrow also made significant contributions to welfare economics with his *Social Choice and Individual Values* (1951). His book targeted the role of strategizing in economics, an idea that was of parallel importance to game theory.

The landmark works in the field of game theory came out of Princeton during and immediately after the war—namely, von Neumann and Morgenstern's *Theory of Games and Economic Behavior* (1944) and two seminal papers by the mathematician John Nash (1950, 1952). Strategic thinking also fostered the pursuit of Operations Research at the RAND Corporation in Santa Monica (founded in 1946). The World War II and the Cold War had much to do with the funding of these new fields, with Thomas Schelling's *Strategy of Conflict* (1960) as one of the best-known results. Related investigations are Rational Choice Theory, associated most closely with James Buchanan, and experimental economics, launched by Vernon Smith and Charles Plott. Herbert Simon's (1916–2001) concept of satisficing has also linked up with the emphasis in Game Theory on suboptimal behavior. In a nutshell, neither utility nor social welfare are maximized because information and cooperation prove to be too costly.

Keynes had traveled to the United States during and after World War II both to advise the American government and to help launch the International Monetary Fund that came out of the famous Bretton Woods gathering of 1944. Keynes's *General Theory of Employment, Interest, and Money* (1936) is widely viewed to this day as the single most influential book of the last century, and his ideas were widely disseminated by Alvin Hansen (1887–1975), Lauchlin Currie (1902–1993), Lawrence R. Klein, Tobin, Galbraith, and Samuelson. Nevertheless, Keynesianism was superseded in the 1950s by Friedman's monetarism and then in the 1970s by the New Classicism of John Muth, Neil Wallace, Thomas Sargent, and Robert Lucas. McCarthyism may have also reinforced this shift since it became expedient for survival to avoid any controversial political issues that might stem from economic analysis. While Keynes was not a socialist, his inclinations toward a planned economy and his skepticism about market forces were seen as suspect.

Two other areas of specialization to which Americans made considerable postwar contributions are consumption theory and economic development. Of the first field, the names of Samuelson, Friedman, Modigliani, Hyman Minsky (1919–1997), James Duesenberry, and William Vickery (1914–1996) belong in the front rank. Of the second field, Kuznets, W. Arthur Lewis (the first major African American economist, originally from St. Lucia), Theodore W. Shultz (1902–1998), Robert Solow, and Albert O. Hirschman are noteworthy. Almost all of these men garnered the Alfred Nobel Memorial Prize in Economic Science, which commenced in 1969.

Until the latter part of the twentieth century, women had been grossly under-represented in American economics, but from those decades forward they have included roughly 25 percent of the profession. More women entered the profession in the interwar years, so that by 1920, 19 percent of Ph.D.'s went to women, though this figure dropped dramatically after World War II. Three who

made important insights in consumption theory during the 1940s were Dorothy Brady (1903–1977), Margaret Reid (1895–1991), and Rose Friedman. Both Rose Friedman and Anna J. Schwartz have coauthored major works with the more famous Milton Friedman, making them the most widely read of contemporary American women economists. Many of the economists listed in this article advised the government – particularly on money, banking, and trade. Significant guidance from economists was widely acknowledged during the Great Depression with Franklin Roosevelt's New Deal. But it was in the postwar period that economists were extensively instituted into the government rather than brought in on an ad hoc basis. The Council of Economic Advisors, established in 1946, oversaw the fiscal reforms of the Kennedy era and took credit for the subsequent economic growth. The American government is replete with committees forging economic policy on virtually every applied field in the discipline. The chairman of the Federal Reserve Board, founded in 1914, is often taken from academic ranks and now stands out as the most powerful player in the American economy. Keynes once remarked of economists that «the world is ruled by little else». For better or for worse, the power that economists now hold in the American government epitomizes the triumph of the economics profession and the widespread view that the economy – and hence human well-being – is within our control.

Economics is the social science that analyzes the production, distribution, and consumption of goods and services. The term *economics* comes from the Ancient Greek (*oikonomia*, «management of a household, administration») from (*oikos*, «house») + νόμος (*nomos*, «custom» or «law»), hence «rules of the house(hold)». Political economy was the earlier name for the subject, but economists in the late 19th century suggested «economics» as a shorter term for «economic science» that also avoided a narrow *political-interest* connotation and as similar in form to «mathematics», «ethics», and so forth.

A focus of the subject is how economic agents behave or interact and how economies work. Consistent with this, a primary textbook distinction is between microeconomics and macroeconomics. Microeconomics examines the behavior of basic elements in the economy, including individual agents (such as households and firms or as buyers and sellers) and markets, and their interactions. Macroeconomics analyzes the entire economy and issues affecting it, including unemployment, inflation, economic growth, and monetary and fiscal policy.

Other broad distinctions include those between positive economics (describing «what is») and normative economics (advocating «what ought to be»); between economic theory and applied economics; between rational and behavioral economics; and between mainstream economics (more «orthodox» and dealing with the «rationality-individualism-equilibrium nexus») and

heterodox economics (more «radical» and dealing with the «institutions-history-social structure nexus»).

Economic analysis may be applied throughout society, as *in* business, finance, health care, and government, but also *to* such diverse subjects as crime, education, the family, law, politics, religion, social institutions, war, and science. At the turn of the 21st century, the expanding domain of economics in the social sciences has been described as economic imperialism. An increasing number of economists have called for increased emphasis on environmental sustainability; this area of research is known as Ecological economics.

Economic Development refers to not only increase in the output and growth of an economy but includes the various changes in the institutional arrangements through which output is generated. Economic Development refers to the achievement of a new equilibrium over the previously attained equilibrium. It is a micro economic concept with direct relation to Economic Growth as Growth can be achieved with or without development but Economic Development always results in growth.

Markets

Microeconomics is the study of economics analysing individual players of a market and the structure of such markets. It deals with, as its irreducible base unit, private, public and domestic players. Microeconomics studies how these players interact with each other through individual markets (assuming that there is a scarcity of tradable units and government regulation. A market might deal with a *product* (such as apples, aluminium and mobile phones), or with *services of a factor of production*, (brick laying, book printing, food packaging). Microeconomics theory considers the aggregates (the sum of) of *quantity demanded* by buyers and *quantity supplied* by sellers, studying each possible price per unit (i.e. supply and demand). It studies the complex interaction between market players both through buying and selling. Theory holds that markets may reach equilibrium between «quantity demanded» and «quantity supplied» (supply and demand) over time.

Microeconomics also examines various market structures. Perfect competition describes a market structure such that no participants are large enough to have the market power to set the price of a homogeneous product. Another way of putting this is to say a perfectly competitive market exists when every participant is a «price taker», and no participant influences the price of the product it buys or sells. Imperfect competition refers to market structures where the conditions of perfect competition do not exist. Forms of imperfect competition include: monopoly (in which there is only one seller of a good), duopoly (in which there are only two sellers of a good), oligopoly (in which there are few sellers of a good), monopolistic competition (in which there are many sellers producing highly differentiated goods), monopsony (in which there

is only one buyer of a good), and oligopsony (in which there are few buyers of a good). Unlike perfect competition, imperfect competition invariably means market power is unequally distributed. Firms under imperfect competition have the potential to be «price makers», which means that, by holding a disproportionately high share of market power, they can influence the prices of their products.

Microeconomics studies individual markets by simplifying the economic system by assuming that activity in the market being analysed does not affect other markets. This method of analysis is known as partial-equilibrium analysis (supply and demand). This method aggregates (the sum of all activity) in only one market. General-equilibrium theory studies various markets and their behaviour. It aggregates (the sum of all activity) across *all* markets. This method studies both changes in markets and their interactions leading towards equilibrium.

Production, cost, and efficiency

In microeconomics, production is the conversion of inputs into outputs. It is an economic process that uses inputs to create a commodity for exchange or direct use. Production is a flow and thus a rate of output per period of time. Distinctions include such production alternatives as for consumption (food, haircuts, etc.) vs. investment goods (new tractors, buildings, roads, etc.), public goods (national defense, small-pox vaccinations, etc.) or private goods (new computers, bananas, etc.), and «guns» vs. «butter».

Opportunity cost refers to the economic cost of production: the value of the next best opportunity foregone. Choices must be made between desirable yet mutually exclusive actions. It has been described as expressing «the basic relationship between scarcity and choice». The opportunity cost of an activity is an element in ensuring that scarce resources are used efficiently, such that the cost is weighed against the value of that activity in deciding on more or less of it. Opportunity costs are not restricted to monetary or financial costs but could be measured by the real cost of output forgone, leisure, or anything else that provides the alternative benefit (utility).

Inputs used in the production process include such primary factors of production as labour services, capital (durable produced goods used in production, such as an existing factory), and land (including natural resources). Other inputs may include intermediate goods used in production of final goods, such as the steel in a new car.

Economic efficiency describes how well a system generates desired output with a given set of inputs and available technology. Efficiency is improved if more output is generated without changing inputs, or in other words, the amount of «waste» is reduced. A widely-accepted general standard is Pareto efficiency,

which is reached when no further change can make someone better off without making someone else worse off.

The production-possibility frontier (PPF) is an expository figure for representing scarcity, cost, and efficiency. In the simplest case an economy can produce just two goods (say «guns» and «butter»). The PPF is a table or graph (as at the right) showing the different quantity combinations of the two goods producible with a given technology and total factor inputs, which limit feasible total output. Each point on the curve shows potential total output for the economy, which is the maximum feasible output of one good, given a feasible output quantity of the other good.

Scarcity is represented in the figure by people being willing but unable in the aggregate to consume *beyond the PPF* (such as at *X*) and by the negative slope of the curve. If production of one good *increases* along the curve, production of the other good *decreases*, an inverse relationship. This is because increasing output of one good requires transferring inputs to it from production of the other good, decreasing the latter. The slope of the curve at a point on it gives the trade-off between the two goods. It measures what an additional unit of one good costs in units forgone of the other good, an example of a *real opportunity cost*. Thus, if one more Gun costs 100 units of butter, the opportunity cost of one Gun is 100 Butter. *Along the PPF*, scarcity implies that choosing *more* of one good in the aggregate entails doing with *less* of the other good. Still, in a market economy, movement along the curve may indicate that the choice of the increased output is anticipated to be worth the cost to the agents.

By construction, each point on the curve shows *productive efficiency* in maximizing output for given total inputs. A point *inside* the curve (as at *A*), is feasible but represents *production inefficiency* (wasteful use of inputs), in that output of *one or both goods* could increase by moving in a northeast direction to a point on the curve. Examples cited of such inefficiency include high unemployment during a business-cycle recession or economic organization of a country that discourages full use of resources. Being on the curve might still not fully satisfy allocative efficiency (also called Pareto efficiency) if it does not produce a mix of goods that consumers prefer over other points.

Much applied economics in public policy is concerned with determining how the efficiency of an economy can be improved. Recognizing the reality of scarcity and then figuring out how to organize society for the most efficient use of resources has been described as the «essence of economics», where the subject «makes its unique contribution».

Specialization

Specialization is considered key to economic efficiency based on theoretical and empirical considerations. Different individuals or nations may have different

real opportunity costs of production, say from differences in stocks of human capital per worker or capital/labour ratios. According to theory, this may give a comparative advantage in production of goods that make more intensive use of the relatively more abundant, thus *relatively* cheaper, input. Even if one region has an absolute advantage as to the ratio of its outputs to inputs in every type of output, it may still specialize in the output in which it has a comparative advantage and thereby gain from trading with a region that lacks any absolute advantage but has a comparative advantage in producing something else.

It has been observed that a high volume of trade occurs among regions even with access to a similar technology and mix of factor inputs, including high-income countries. This has led to investigation of economies of scale and agglomeration to explain specialization in similar but differentiated product lines, to the overall benefit of respective trading parties or regions.

The general theory of specialization applies to trade among individuals, farms, manufacturers, service providers, and economies. Among each of these production systems, there may be a corresponding *division of labour* with different work groups specializing, or correspondingly different types of capital equipment and differentiated land uses.

An example that combines features above is a country that specializes in the production of high-tech knowledge products, as developed countries do, and trades with developing nations for goods produced in factories where labour is relatively cheap and plentiful, resulting in different in opportunity costs of production. More total output and utility thereby results from specializing in production and trading than if each country produced its own high-tech and low-tech products.

Theory and observation set out the conditions such that market prices of outputs and productive inputs select an allocation of factor inputs by comparative advantage, so that (relatively) low-cost inputs go to producing low-cost outputs. In the process, aggregate output may increase as a by-product or by design. Such specialization of production creates opportunities for *gains from trade* whereby resource owners benefit from trade in the sale of one type of output for other, more highly valued goods. A measure of gains from trade is the *increased income levels* that trade may facilitate.

Supply and demand

Prices and quantities have been described as the most directly observable attributes of goods produced and exchanged in a market economy. The theory of supply and demand is an organizing principle for explaining how prices coordinate the amounts produced and consumed. In microeconomics, it applies to price and output determination for a market with perfect competition, which includes the condition of no buyers or sellers large enough to have price-setting power.

For a given market of a commodity, *demand* is the relation of the quantity that all buyers would be prepared to purchase at each unit price of the good. Demand is often represented by a table or a graph showing price and quantity demanded (as in the figure). Demand theory describes individual consumers as rationally choosing the most preferred quantity of each good, given income, prices, tastes, etc. A term for this is «constrained utility maximization» (with income and wealth as the constraints on demand). Here, utility refers to the hypothesized relation of each individual consumer for ranking different commodity bundles as more or less preferred.

The law of demand states that, in general, price and quantity demanded in a given market are inversely related. That is, the higher the price of a product, the less of it people would be prepared to buy of it (other things unchanged). As the price of a commodity falls, consumers move toward it from relatively more expensive goods (the substitution effect). In addition, purchasing power from the price decline increases ability to buy (the income effect). Other factors can change demand; for example an increase in income will shift the demand curve for a normal good outward relative to the origin, as in the figure. All determinants are predominantly taken as constant factors of demand and supply.

Supply is the relation between the price of a good and the quantity available for sale at that price. It may be represented as a table or graph relating price and quantity supplied. Producers, for example business firms, are hypothesized to be *profit-maximizers*, meaning that they attempt to produce and supply the amount of goods that will bring them the highest profit. Supply is typically represented as a directly-proportional relation between price and quantity supplied (other things unchanged). That is, the higher the price at which the good can be sold, the more of it producers will supply, as in the figure. The higher price makes it profitable to increase production. Just as on the demand side, the position of the supply can shift, say from a change in the price of a productive input or a technical improvement. The «Law of Supply» states that, in general, a rise in price leads to an expansion in supply and a fall in price leads to a contraction in supply. Here as well, the determinants of supply, such as price of substitutes, cost of production, technology applied and various factors inputs of production are all taken to be constant for a specific time period of evaluation of supply.

Market equilibrium occurs where quantity supplied equals quantity demanded, the intersection of the supply and demand curves in the figure above. At a price below equilibrium, there is a shortage of quantity supplied compared to quantity demanded. This is posited to bid the price up. At a price above equilibrium, there is a surplus of quantity supplied compared to quantity demanded. This pushes the price down. The model of supply and demand predicts that for given supply and demand curves, price and quantity will stabilize at the price that makes quantity supplied equal to quantity demanded.

Similarly, demand-and-supply theory predicts a new price-quantity combination from a shift in demand (as to the figure), or in supply.

For a given quantity of a consumer good, the point on the demand curve indicates the value, or marginal utility, to consumers for that unit. It measures what the consumer would be prepared to pay for that unit. The corresponding point on the supply curve measures marginal cost, the increase in total cost to the supplier for the corresponding unit of the good. The price in equilibrium is determined by supply and demand. In a perfectly competitive market, supply and demand equate marginal cost and marginal utility at equilibrium.

On the supply side of the market, some factors of production are described as (relatively) *variable* in the short run, which affects the cost of changing output levels. Their usage rates can be changed easily, such as electrical power, raw-material inputs, and over-time and temp work. Other inputs are relatively *fixed*, such as plant and equipment and key personnel. In the long run, all inputs may be adjusted by management. These distinctions translate to differences in the elasticity (responsiveness) of the supply curve in the short and long runs and corresponding differences in the price-quantity change from a shift on the supply or demand side of the market.

Marginalist theory, such as above, describes the consumers as attempting to reach most-preferred positions, subject to income and wealth constraints while producers attempt to maximize profits subject to their own constraints, including demand for goods produced, technology, and the price of inputs. For the consumer, that point comes where marginal utility of a good, net of price, reaches zero, leaving no net gain from further consumption increases. Analogously, the producer compares marginal revenue (identical to price for the perfect competitor) against the marginal cost of a good, with *marginal profit* the difference. At the point where marginal profit reaches zero, further increases in production of the good stop. For movement to market equilibrium and for changes in equilibrium, price and quantity also change «at the margin»: more-or-less of something, rather than necessarily all-or-nothing.

Other applications of demand and supply include the distribution of income among the factors of production, including labour and capital, through factor markets. In a competitive labour market for example the quantity of labour employed and the price of labour (the wage rate) depends on the demand for labour (from employers for production) and supply of labour (from potential workers). Labour economics examines the interaction of workers and employers through such markets to explain patterns and changes of wages and other labour income, labour mobility, and (un)employment, productivity through human capital, and related public-policy issues.

Demand-and-supply analysis is used to explain the behavior of perfectly competitive markets, but as a standard of comparison it can be extended to any type of market. It can also be generalized to explain variables across the

economy, for example, total output (estimated as real GDP) and the general price level, as studied in macroeconomics. Tracing the qualitative and quantitative effects of variables that change supply and demand, whether in the short or long run, is a standard exercise in applied economics. Economic theory may also specify conditions such that supply and demand through the market is an efficient mechanism for allocating resources.

Firms

People frequently do not trade directly on markets. Instead, on the supply side, they may work in and produce through *firms*. The most obvious kinds of firms are corporations, partnerships and trusts. According to Ronald Coase people begin to organise their production in firms when the costs of doing business becomes lower than doing it on the market. Firms combine labour and capital, and can achieve far greater economies of scale (when the average cost per unit declines as more units are produced) than individual market trading.

In perfectly-competitive markets studied in the theory of supply and demand, there are many producers, none of which significantly influence price. Industrial organization generalizes from that special case to study the strategic behavior of firms that do have significant control of price. It considers the structure of such markets and their interactions. Common market structures studied besides perfect competition include monopolistic competition, various forms of oligopoly, and monopoly.

Managerial economics applies microeconomic analysis to specific decisions in business firms or other management units. It draws heavily from quantitative methods such as operations research and programming and from statistical methods such as regression analysis in the absence of certainty and perfect knowledge. A unifying theme is the attempt to optimize business decisions, including unit-cost minimization and profit maximization, given the firm's objectives and constraints imposed by technology and market conditions.

Uncertainty and game theory

Uncertainty in economics is an unknown prospect of gain or loss, whether quantifiable as risk or not. Without it, household behavior would be unaffected by uncertain employment and income prospects, financial and capital markets would reduce to exchange of a single instrument in each market period, and there would be no communications industry. Given its different forms, there are various ways of representing uncertainty and modelling economic agents' responses to it.

Game theory is a branch of applied mathematics that considers strategic interactions between agents, one kind of uncertainty. It provides a mathematical foundation of industrial organization, discussed above, to model different types of firm behavior, for example in an oligopolistic industry (few sellers), but equally applicable to wage negotiations, bargaining, contract design, and any

situation where individual agents are few enough to have perceptible effects on each other. As a method heavily used in behavioral economics, it postulates that agents choose strategies to maximize their payoffs, given the strategies of other agents with at least partially conflicting interests. In this, it generalizes maximization approaches developed to analyze market actors such as in the supply and demand model and allows for incomplete information of actors. The field dates from the 1944 classic *Theory of Games and Economic Behavior* by John von Neumann and Oskar Morgenstern. It has significant applications seemingly outside of economics in such diverse subjects as formulation of nuclear strategies, ethics, political science, and evolutionary biology.

Risk aversion may stimulate activity that in well-functioning markets smooths out risk and communicates information about risk, as in markets for insurance, commodity futures contracts, and financial instruments. Financial economics or simply finance describes the allocation of financial resources. It also analyzes the pricing of financial instruments, the financial structure of companies, the efficiency and fragility of financial markets, financial crises, and related government policy or regulation.

Some market organizations may give rise to inefficiencies associated with uncertainty. Based on George Akerlof's «Market for Lemons» article, the paradigm example is of a dodgy second-hand car market. Customers without knowledge of whether a car is a «lemon» depress its price below what a quality second-hand car would be. Information asymmetry arises here, if the seller has more relevant information than the buyer but no incentive to disclose it. Related problems in insurance are adverse selection, such that those at most risk are most likely to insure (say reckless drivers), and moral hazard, such that insurance results in riskier behavior (say more reckless driving). Both problems may raise insurance costs and reduce efficiency in driving otherwise willing transactors from the market («incomplete markets»). Moreover, attempting to reduce one problem, say adverse selection by mandating insurance, may add to another, say moral hazard. Information economics, which studies such problems, has relevance in subjects such as insurance, contract law, mechanism design, monetary economics, and health care. Applied subjects include market and legal remedies to spread or reduce risk, such as warranties, government-mandated partial insurance, restructuring or bankruptcy law, inspection, and regulation for quality and information disclosure.

Market failure

The term «market failure» encompasses several problems which may undermine standard economic assumptions. Although economists categorise market failures differently, the following categories emerge in the main texts.

Information asymmetries and incomplete markets may result in economic inefficiency but also a possibility of improving efficiency through market, legal, and regulatory remedies, as discussed above.

Natural monopoly, or the overlapping concepts of «practical» and «technical» monopoly, is an extreme case of *failure of competition* as a restraint on producers. The problem is described as one where the more of a product is made, the lower the unit costs are. This means it only makes economic sense to have one producer.

Public goods are goods which are undersupplied in a typical market. The defining features are that people can consume public goods without having to pay for them and that more than one person can consume the good at the same time.

Externalities occur where there are significant social costs or benefits from production or consumption that are not reflected in market prices. For example, air pollution may generate a negative externality, and education may generate a positive externality (less crime, etc.). Governments often tax and otherwise restrict the sale of goods that have negative externalities and subsidize or otherwise promote the purchase of goods that have positive externalities in an effort to correct the price distortions caused by these externalities. Elementary demand-and-supply theory predicts equilibrium but not the speed of adjustment for changes of equilibrium due to a shift in demand or supply.

In many areas, some form of price stickiness is postulated to account for quantities, rather than prices, adjusting in the short run to changes on the demand side or the supply side. This includes standard analysis of the business cycle in macroeconomics. Analysis often revolves around causes of such price stickiness and their implications for reaching a hypothesized long-run equilibrium. Examples of such price stickiness in particular markets include wage rates in labour markets and posted prices in markets deviating from perfect competition.

Macroeconomic instability, addressed below, is a prime source of market failure, where by a general loss of business confidence or external shock can grind production and distribution to a halt, undermining ordinary markets that are otherwise sound.

Some specialised fields of economics deal in market failure more than others. The economics of the public sector is one example, since where markets fail, some kind of regulatory or government programme is the remedy. Much environmental economics concerns externalities or «public bads».

Policy options include regulations that reflect cost-benefit analysis or market solutions that change incentives, such as emission fees or redefinition of property rights.

Public sector

Public finance is the field of economics that deals with budgeting the revenues and expenditures of a public sector entity, usually government. The subject addresses such matters as tax incidence (who really pays a particular tax), cost-benefit analysis of government programs, effects on economic efficiency and income distribution of different kinds of spending and taxes, and fiscal politics. The latter, an aspect of public choice theory, models public-sector behavior analogously to microeconomics, involving interactions of self-interested voters, politicians, and bureaucrats.

Much of economics is positive, seeking to describe and predict economic phenomena. Normative economics seeks to identify what economies *ought* to be like.

Welfare economics is a normative branch of economics that uses microeconomic techniques to simultaneously determine the allocative efficiency within an economy and the income distribution associated with it. It attempts to measure social welfare by examining the economic activities of the individuals that comprise society.

Macroeconomics

Macroeconomics examines the economy as a whole to explain broad aggregates and their interactions «top down», that is, using a simplified form of general-equilibrium theory. Such aggregates include national income and output, the unemployment rate, and price inflation and subaggregates like total consumption and investment spending and their components. It also studies effects of monetary policy and fiscal policy.

Since at least the 1960s, macroeconomics has been characterized by further integration as to micro-based modeling of sectors, including rationality of players, efficient use of market information, and imperfect competition. This has addressed a long-standing concern about inconsistent developments of the same subject.

Macroeconomic analysis also considers factors affecting the long-term level and growth of national income. Such factors include capital accumulation, technological change and labour force growth.

Growth

Growth economics studies factors that explain economic growth – the increase in output per capita of a country over a long period of time. The same factors are used to explain differences in the *level* of output per capita *between* countries, in particular why some countries grow faster than others, and whether countries converge at the same rates of growth.

Much-studied factors include the rate of investment, population growth, and technological change. These are represented in theoretical and empirical forms

(as in the neoclassical and endogenous growth models) and in growth accounting.

Business cycle

The economics of a depression were the spur for the creation of «macroeconomics» as a separate discipline field of study. During the Great Depression of the 1930s, John Maynard Keynes authored a book entitled *The General Theory of Employment, Interest and Money* outlining the key theories of Keynesian economics. Keynes contended that aggregate demand for goods might be insufficient during economic downturns, leading to unnecessarily high unemployment and losses of potential output.

He therefore advocated active policy responses by the public sector, including monetary policy actions by the central bank and fiscal policy actions by the government to stabilize output over the business cycle. Thus, a central conclusion of Keynesian economics is that, in some situations, no strong automatic mechanism moves output and employment towards full employment levels. John Hicks' IS/LM model has been the most influential interpretation of *The General Theory*.

Over the years, understanding of the business cycle has branched into various research programs, mostly related to or distinct from Keynesianism. The neoclassical synthesis refers to the reconciliation of Keynesian economics with neoclassical economics, stating that Keynesianism is correct in the short run but qualified by neoclassical-like considerations in the intermediate and long run.

New classical macroeconomics, as distinct from the Keynesian view of the business cycle, posits market clearing with imperfect information. It includes Friedman's permanent income hypothesis on consumption and «rational expectations» theory, lead by Robert Lucas, and real business cycle theory.

In contrast, the new Keynesian approach retains the rational expectations assumption, however it assumes a variety of market failures. In particular, New Keynesians assume prices and wages are «sticky», which means they do not adjust instantaneously to changes in economic conditions.

Thus, the new classicals assume that prices and wages adjust automatically to attain full employment, whereas the new Keynesians see full employment as being automatically achieved only in the long run, and hence government and central-bank policies are needed because the «long run» may be very long.

Unemployment

The amount of unemployment in an economy is measured by the unemployment rate, the percentage of workers without jobs in the labour force. The labour force only includes workers actively looking for jobs. People who are retired, pursuing education, or discouraged from seeking work by a lack of job prospects are excluded from the labor force. Unemployment can be generally

broken down into several types that are related to different causes. Classical unemployment occurs when wages are too high for employers to be willing to hire more workers. Wages may be too high because of minimum wage laws or union activity. Consistent with classical unemployment, frictional unemployment occurs when appropriate job vacancies exist for a worker, but the length of time needed to search for and find the job leads to a period of unemployment. Structural unemployment covers a variety of possible causes of unemployment including a mismatch between workers' skills and the skills required for open jobs. Large amounts of structural unemployment can occur when an economy is transitioning industries and workers find their previous set of skills are no longer in demand. Structural unemployment is similar to frictional unemployment since both reflect the problem of matching workers with job vacancies, but structural unemployment covers the time needed to acquire new skills not just the short term search process. While some types of unemployment may occur regardless of the condition of the economy, cyclical unemployment occurs when growth stagnates. Okun's law represents the empirical relationship between unemployment and economic growth. The original version of Okun's law states that a 3 % increase in output would lead to a 1 % decrease in unemployment.

Inflation and monetary policy

Money is a *means of final payment* for goods in most price system economies and the unit of account in which prices are typically stated. A very apt statement by Professor Walker, a well-known economist is that, «Money is what money does». Money has a general acceptability, a relative consistency in value, divisibility, durability, portability, elastic in supply and survives with mass public confidence. It includes currency held by the nonbank public and checkable deposits. It has been described as a social convention, like language, useful to one largely because it is useful to others.

As a medium of exchange, money facilitates trade. It is essentially a measure of value and more importantly, a store of value being a basis for credit creation. Its economic function can be contrasted with barter (non-monetary exchange). Given a diverse array of produced goods and specialized producers, barter may entail a hard-to-locate double coincidence of wants as to what is exchanged, say apples and a book. Money can reduce the transaction cost of exchange because of its ready acceptability. Then it is less costly for the seller to accept money in exchange, rather than what the buyer produces.

At the level of an economy, theory and evidence are consistent with a positive relationship running from the total money supply to the nominal value of total output and to the general price level. For this reason, management of the money supply is a key aspect of monetary policy.

Fiscal policy

Governments implement fiscal policy by adjusting spending and taxation policies to alter aggregate demand. When aggregate demand falls below the potential output of the economy, there is an output gap where some productive capacity is left unemployed. Governments increase spending and cut taxes to boost aggregate demand. Resources that have been idled can be used by the government. For example, unemployed home builders can be hired to expand highways. Tax cuts allow consumers to increase their spending, which boosts aggregate demand. Both tax cuts and spending have multiplier effects where the initial increase in demand from the policy percolates through the economy and generates additional economic activity.

The effects of fiscal policy can be limited by crowding out. When there is no output gap, the economy is producing at full capacity and there are no excess productive resources. If the government increases spending in this situation, the government use resources that otherwise would have been used by the private sector, so there is no increase in overall output. Some economists think that crowding out is always an issue while others do not think it is a major issue when output is depressed. Skeptics of fiscal policy also make the argument of Ricardian equivalence. They argue that an increase in debt will have to be paid for with future tax increases, which will cause people to reduce their consumption and save money to pay for the future tax increase. Under Ricardian equivalence, any boost in demand from fiscal policy will be offset by the increased savings rate intended to pay for future higher taxes.

International economics

International trade studies determinants of goods-and-services flows across international boundaries. It also concerns the size and distribution of gains from trade. Policy applications include estimating the effects of changing tariff rates and trade quotas. International finance is a macroeconomic field which examines the flow of capital across international borders, and the effects of these movements on exchange rates. Increased trade in goods, services and capital between countries is a major effect of contemporary globalization.

The distinct field of *development economics* examines economic aspects of the development process in relatively low-income countries focusing on structural change, poverty, and economic growth. Approaches in development economics frequently incorporate social and political factors.

Economic systems is the branch of economics that studies the methods and institutions by which societies determine the ownership, direction, and allocation of economic resources. An *economic system* of a society is the unit of analysis.

Among contemporary systems at different ends of the organizational spectrum are socialist systems and capitalist systems, in which most production

occurs in respectively state-run and private enterprises. In between are mixed economies. A common element is the interaction of economic and political influences, broadly described as political economy. *Comparative economic systems* studies the relative performance and behavior of different economies or systems.

Practice

Contemporary economics uses mathematics. Economists draw on the tools of calculus, linear algebra, statistics, game theory, and computer science. Professional economists are expected to be familiar with these tools, while a minority specialize in econometrics and mathematical methods.

Theory

Mainstream economic theory relies upon a priori quantitative economic models, which employ a variety of concepts. Theory typically proceeds with an assumption of *ceteris paribus*, which means holding constant explanatory variables other than the one under consideration. When creating theories, the objective is to find ones which are at least as simple in information requirements, more precise in predictions, and more fruitful in generating additional research than prior theories.

In microeconomics, principal concepts include supply and demand, marginalism, rational choice theory, opportunity cost, budget constraints, utility, and the theory of the firm. Early macroeconomic models focused on modeling the relationships between aggregate variables, but as the relationships appeared to change over time macroeconomists, including new Keynesians, reformulated their models in microfoundations.

The aforementioned microeconomic concepts play a major part in macroeconomic models – for instance, in monetary theory, the quantity theory of money predicts that increases in the money supply increase inflation, and inflation is assumed to be influenced by rational expectations. In development economics, slower growth in developed nations has been sometimes predicted because of the declining marginal returns of investment and capital, and this has been observed in the Four Asian Tigers. Sometimes an economic hypothesis is only *qualitative*, not *quantitative*.

Expositions of economic reasoning often use two-dimensional graphs to illustrate theoretical relationships. At a higher level of generality, Paul Samuelson's treatise *Foundations of Economic Analysis* (1947) used mathematical methods to represent the theory, particularly as to maximizing behavioral relations of agents reaching equilibrium. The book focused on examining the class of statements called *operationally meaningful theorems* in economics, which are theorems that can conceivably be refuted by empirical data.

Empirical investigation

Economic theories are frequently tested empirically, largely through the use of econometrics using economic data. The controlled experiments common to the physical sciences are difficult and uncommon in economics, and instead broad data is observationally studied; this type of testing is typically regarded as less rigorous than controlled experimentation, and the conclusions typically more tentative. However, the field of experimental economics is growing, and increasing use is being made of natural experiments.

Statistical methods such as regression analysis are common. Practitioners use such methods to estimate the size, economic significance, and statistical significance («signal strength») of the hypothesized relation(s) and to adjust for noise from other variables. By such means, a hypothesis may gain acceptance, although in a probabilistic, rather than certain, sense. Acceptance is dependent upon the falsifiable hypothesis surviving tests. Use of commonly accepted methods need not produce a final conclusion or even a consensus on a particular question, given different tests, data sets, and prior beliefs.

Criticism based on professional standards and non-replicability of results serve as further checks against bias, errors, and over-generalization, although much economic research has been accused of being non-replicable, and prestigious journals have been accused of not facilitating replication through the provision of the code and data. Like theories, uses of test statistics are themselves open to critical analysis, although critical commentary on papers in economics in prestigious journals such as the *American Economic Review* has declined precipitously in the past 40 years. This has been attributed to journals' incentives to maximize citations in order to rank higher on the Social Science Citation Index (SSCI).

In applied economics, input-output models employing linear programming methods are quite common. Large amounts of data are run through computer programs to analyze the impact of certain policies; IMPLAN is one well-known example.

Experimental economics has promoted the use of scientifically controlled experiments. This has reduced long-noted distinction of economics from natural sciences allowed direct tests of what were previously taken as axioms. In some cases these have found that the axioms are not entirely correct; for example, the ultimatum game has revealed that people reject unequal offers.

In behavioral economics, psychologist Daniel Kahneman won the Nobel Prize in economics in 2002 for his and Amos Tversky's empirical discovery of several cognitive biases and heuristics. Similar empirical testing occurs in neuroeconomics. Another example is the assumption of narrowly selfish preferences versus a model that tests for selfish, altruistic, and cooperative preferences. These techniques have led some to argue that economics is a «genuine science».

Profession

The professionalization of economics, reflected in the growth of graduate programs on the subject, has been described as «the main change in economics since around 1900». Most major universities and many colleges have a major, school, or department in which academic degrees are awarded in the subject, whether in the liberal arts, business, or for professional study; see Master of Economics.

The Nobel Memorial Prize in Economic Sciences (commonly known as the Nobel Prize in Economics) is a prize awarded to economists each year for outstanding intellectual contributions in the field. In the private sector, professional economists are employed as consultants and in industry, including banking and finance. Economists also work for various government departments and agencies, for example, the national Treasury, Central Bank or Bureau of Statistics.

Related subjects

Economics is one social science among several and has fields bordering on other areas, including economic geography, economic history, public choice, energy economics, cultural economics, family economics and institutional economics.

Law and economics, or economic analysis of law, is an approach to legal theory that applies methods of economics to law. It includes the use of economic concepts to explain the effects of legal rules, to assess which legal rules are economically efficient, and to predict what the legal rules will be. A seminal article by Ronald Coase published in 1961 suggested that well-defined property rights could overcome the problems of externalities.

Political economy is the interdisciplinary study that combines economics, law, and political science in explaining how political institutions, the political environment, and the economic system (capitalist, socialist, mixed) influence each other. It studies questions such as how monopoly, rent-seeking behavior, and externalities should impact government policy. Historians have employed *political economy* to explore the ways in the past that persons and groups with common economic interests have used politics to effect changes beneficial to their interests.

Energy economics is a broad scientific subject area which includes topics related to energy supply and energy demand. Georgescu-Roegen reintroduced the concept of entropy in relation to economics and energy from thermodynamics, as distinguished from what he viewed as the mechanistic foundation of neoclassical economics drawn from Newtonian physics. His work contributed significantly to thermoeconomics and to ecological economics. He also did foundational work which later developed into evolutionary economics.

The sociological subfield of economic sociology arose, primarily through the work of Émile Durkheim, Max Weber and Georg Simmel, as an approach to analysing the effects of economic phenomena in relation to the overarching social paradigm (i.e. modernity). Classic works include Max Weber's *The Protestant Ethic and the Spirit of Capitalism* (1905) and Georg Simmel's *The Philosophy of Money* (1900). More recently, the works of Mark Granovetter, Peter Hedstrom and Richard Swedberg have been influential in this field.

History

Economic writings date from earlier Mesopotamian, Greek, Roman, Indian subcontinent, Chinese, Persian, and Arab civilizations. Notable writers from antiquity through to the 14th century include Aristotle, Xenophon, Chanakya (also known as Kautilya), Qin Shi Huang, Thomas Aquinas, and Ibn Khaldun. The works of Aristotle had a profound influence on Aquinas, who in turn influenced the late scholastics of the 14th to 17th centuries. Joseph Schumpeter described the latter as «coming nearer than any other group to being the 'founders' of scientific economics» as to monetary, interest, and value theory within a natural-law perspective.

Two groups, later called «mercantilists» and «physiocrats», more directly influenced the subsequent development of the subject. Both groups were associated with the rise of economic nationalism and modern capitalism in Europe. Mercantilism was an economic doctrine that flourished from the 16th to 18th century in a prolific pamphlet literature, whether of merchants or statesmen. It held that a nation's wealth depended on its accumulation of gold and silver. Nations without access to mines could obtain gold and silver from trade only by selling goods abroad and restricting imports other than of gold and silver. The doctrine called for importing cheap raw materials to be used in manufacturing goods, which could be exported, and for state regulation to impose protective tariffs on foreign manufactured goods and prohibit manufacturing in the colonies.

Physiocrats, a group of 18th century French thinkers and writers, developed the idea of the economy as a circular flow of income and output. Physiocrats believed that only agricultural production generated a clear surplus over cost, so that agriculture was the basis of all wealth. Thus, they opposed the mercantilist policy of promoting manufacturing and trade at the expense of agriculture, including import tariffs. Physiocrats advocated replacing administratively costly tax collections with a single tax on income of land owners. In reaction against copious mercantilist trade regulations, the physiocrats advocated a policy of *laissez-faire*, which called for minimal government intervention in the economy.

Modern economic analysis is customarily said to have begun with Adam Smith (1723–1790). Smith was harshly critical of the mercantilists but described the physiocratic system «with all its imperfections» as «perhaps the purest approximation to the truth that has yet been published» on the subject.

Classical political economy

Publication of Adam Smith's *The Wealth of Nations* in 1776, has been described as «the effective birth of economics as a separate discipline». The book identified land, labor, and capital as the three factors of production and the major contributors to a nation's wealth, as distinct from the Physiocratic idea that only agriculture was productive.

Smith discusses potential benefits of specialization by division of labour, including increased labour productivity and gains from trade, whether between town and country or across countries. His «theorem» that «the division of labor is limited by the extent of the market» has been described as the «core of a theory of the functions of firm and industry» and a «fundamental principle of economic organization». To Smith has also been ascribed «the most important substantive proposition in all of economics» and foundation of resource-allocation theory – that, under competition, resource owners (of labour, land, and capital) seek their most profitable uses, resulting in an equal rate of return for all uses in equilibrium (adjusted for apparent differences arising from such factors as training and unemployment).

In an argument that includes «one of the most famous passages in all economics», Smith represents every individual as trying to employ any capital they might command for their own advantage, not that of the society, and for the sake of profit, which is necessary at some level for employing capital in domestic industry, and positively related to the value of produce. In this:

He generally, indeed, neither intends to promote the public interest, nor knows how much he is promoting it. By preferring the support of domestic to that of foreign industry, he intends only his own security; and by directing that industry in such a manner as its produce may be of the greatest value, he intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention. Nor is it always the worse for the society that it was no part of it. By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it.

Economists have linked Smith's invisible-hand concept to his concern for the common man and woman through economic growth and development, enabling higher levels of consumption, which Smith describes as «the sole end and purpose of all production». He embeds the «invisible hand» in a framework that includes limiting restrictions on competition and foreign trade by government and industry in the same chapter and elsewhere regulation of banking and the interest rate, provision of a «natural system of liberty» – national defence, an egalitarian justice and legal system, and certain institutions and public works with general benefits to the whole society that might otherwise be unprofitable to produce, such as education and roads, canals, and the like. An influential introductory textbook includes parallel discussion and this

assessment: «Above all, it is Adam Smith's vision of a self-regulating invisible hand that is his enduring contribution to modern economics».

The Rev. Thomas Robert Malthus (1798) used the idea of diminishing returns to explain low living standards. Human population, he argued, tended to increase geometrically, outstripping the production of food, which increased arithmetically. The force of a rapidly growing population against a limited amount of land meant diminishing returns to labour. The result, he claimed, was chronically low wages, which prevented the standard of living for most of the population from rising above the subsistence level.

Malthus also questioned the automatic tendency of a market economy to produce full employment. He blamed unemployment upon the economy's tendency to limit its spending by saving too much, a theme that lay forgotten until John Maynard Keynes revived it in the 1930s.

While Adam Smith emphasized the production of income, David Ricardo (1817) focused on the distribution of income among landowners, workers, and capitalists. Ricardo saw an inherent conflict between landowners on the one hand and labour and capital on the other. He posited that the growth of population and capital, pressing against a fixed supply of land, pushes up rents and holds down wages and profits. Ricardo was the first to state and prove the principle of comparative advantage, according to which each country should specialize in producing and exporting goods in that it has a lower *relative* cost of production, rather relying only on its own production. It has been termed a «fundamental analytical explanation» for gains from trade.

Coming at the end of the Classical tradition, John Stuart Mill (1848) parted company with the earlier classical economists on the inevitability of the distribution of income produced by the market system. Mill pointed to a distinct difference between the market's two roles: allocation of resources and distribution of income. The market might be efficient in allocating resources but not in distributing income, he wrote, making it necessary for society to intervene.

Value theory was important in classical theory. Smith wrote that the «real price of every thing ... is the toil and trouble of acquiring it» as influenced by its scarcity. Smith maintained that, with rent and profit, other costs besides wages also enter the price of a commodity. Other classical economists presented variations on Smith, termed the 'labour theory of value'. Classical economics focused on the tendency of markets to move to long-run equilibrium.

Marxism

Marxist (later, Marxian) economics descends from classical economics. It derives from the work of Karl Marx. The first volume of Marx's major work, *Das Kapital*, was published in German in 1867. In it, Marx focused on the labour theory of value and the theory of surplus value which, he believed,

explained the exploitation of labour by capital. The labour theory of value held that the value of an exchanged commodity was determined by the labour that went into its production and the theory of surplus value demonstrated how the workers only got paid a proportion of the value their work had created.

Neoclassical economics

A body of theory later termed «neoclassical economics» or «marginalism» formed from about 1870 to 1910. The term «economics» was popularized by such neoclassical economists as Alfred Marshall as a concise synonym for 'economic science' and a substitute for the earlier «political economy». This corresponded to the influence on the subject of mathematical methods used in the natural sciences.

Neoclassical economics systematized supply and demand as joint determinants of price and quantity in market equilibrium, affecting both the allocation of output and the distribution of income. It dispensed with the labour theory of value inherited from classical economics in favor of a marginal utility theory of value on the demand side and a more general theory of costs on the supply side. In the 20th century, neoclassical theorists moved away from an earlier notion suggesting that total utility for a society could be measured in favor of ordinal utility, which hypothesizes merely behavior-based relations across persons.

In microeconomics, neoclassical economics represents incentives and costs as playing a pervasive role in shaping decision making. An immediate example of this is the consumer theory of individual demand, which isolates how prices (as costs) and income affect quantity demanded. In macroeconomics it is reflected in an early and lasting neoclassical synthesis with Keynesian macroeconomics.

Neoclassical economics is occasionally referred as *orthodox economics* whether by its critics or sympathizers. Modern mainstream economics builds on neoclassical economics but with many refinements that either supplement or generalize earlier analysis, such as econometrics, game theory, analysis of market failure and imperfect competition, and the neoclassical model of economic growth for analyzing long-run variables affecting national income.

Keynesian economics

Keynesian economics derives from John Maynard Keynes, in particular his book *The General Theory of Employment, Interest and Money* (1936), which ushered in contemporary macroeconomics as a distinct field. The book focused on determinants of national income in the short run when prices are relatively inflexible. Keynes attempted to explain in broad theoretical detail why high labour-market unemployment might not be self-correcting due to low «effective demand» and why even price flexibility and monetary policy might be

unavailing. Such terms as «revolutionary» have been applied to the book in its impact on economic analysis.

Keynesian economics has two successors. Post-Keynesian economics also concentrates on macroeconomic rigidities and adjustment processes. Research on micro foundations for their models is represented as based on real-life practices rather than simple optimizing models. It is generally associated with the University of Cambridge and the work of Joan Robinson.

New-Keynesian economics is also associated with developments in the Keynesian fashion. Within this group researchers tend to share with other economists the emphasis on models employing micro foundations and optimizing behavior but with a narrower focus on standard Keynesian themes such as price and wage rigidity. These are usually made to be endogenous features of the models, rather than simply assumed as in older Keynesian-style ones.

Chicago school of economics

The Chicago School of economics is best known for its free market advocacy and monetarist ideas. According to Milton Friedman and monetarists, market economies are inherently stable if the money supply does not greatly expand or contract. Ben Bernanke, current Chairman of the Federal Reserve, is among the economists today generally accepting Friedman's analysis of the causes of the Great Depression.

Milton Friedman effectively took many of the basic principles set forth by Adam Smith and the classical economists and modernized them. One example of this is his article in the September 1970 issue of *The New York Times Magazine*, where he claims that the social responsibility of business should be «to use its resources and engage in activities designed to increase its profits...(through) open and free competition without deception or fraud».

Other schools and approaches

Other well-known schools or trends of thought referring to a particular style of economics practiced at and disseminated from well-defined groups of academicians that have become known worldwide, include the Austrian School, the Freiburg School, the School of Lausanne, post-Keynesian economics and the Stockholm school. Contemporary mainstream economics is sometimes separated into the Saltwater approach of those universities along the Eastern and Western coasts of the US, and the Freshwater, or Chicago-school approach.

Within macroeconomics there is, in general order of their appearance in the literature; classical economics, Keynesian economics, the neoclassical synthesis, post-Keynesian economics, monetarism, new classical economics, and supply-side economics. Alternative developments include ecological economics, constitutional economics, institutional economics, evolutionary economics, dependency theory, structuralist economics, world systems theory, econophysics, feminist economics and biophysical economics.

Criticisms

General criticisms

«The dismal science» is a derogatory alternative name for economics devised by the Victorian historian Thomas Carlyle in the 19th century. It is often stated that Carlyle gave economics the nickname «the dismal science» as a response to the late 18th century writings of The Reverend Thomas Robert Malthus, who grimly predicted that starvation would result, as projected population growth exceeded the rate of increase in the food supply. However, the actual phrase was coined by Carlyle in the context of a debate with John Stuart Mill on slavery, in which Carlyle argued for slavery, while Mill opposed it.

Some economists, like John Stuart Mill or Léon Walras, have maintained that the production of wealth should not be tied to its distribution. The former is in the field of «applied economics» while the latter belongs to «social economics» and is largely a matter of power and politics.

In *The Wealth of Nations*, Adam Smith addressed many issues that are currently also the subject of debate and dispute. Smith repeatedly attacks groups of politically aligned individuals who attempt to use their collective influence to manipulate a government into doing their bidding. In Smith's day, these were referred to as factions, but are now more commonly called special interests, a term which can comprise international bankers, corporate conglomerations, outright oligopolies, monopolies, trade unions and other groups.

Economics per se, as a social science, is independent of the political acts of any government or other decision-making organization, however, many policymakers or individuals holding highly ranked positions that can influence other people's lives are known for arbitrarily using a plethora of economic concepts and rhetoric as vehicles to legitimize agendas and value systems, and do not limit their remarks to matters relevant to their responsibilities. The close relation of economic theory and practice with politics is a focus of contention that may shade or distort the most unpretentious original tenets of economics, and is often confused with specific social agendas and value systems. Notwithstanding, economics legitimately has a role in informing government policy. It is, indeed, in some ways an outgrowth of the older field of political economy. Some academic economic journals are currently focusing increased efforts on gauging the consensus of economists regarding certain policy issues in hopes of effecting a more informed political environment. Currently, there exists a low approval rate from professional economists regarding many public policies. Policy issues featured in a recent survey of AEA economists include trade restrictions, social insurance for those put out of work by international competition, genetically modified foods, curbside recycling, health insurance (several questions), medical malpractice, barriers to entering the medical profession, organ donations, unhealthy foods, mortgage deductions, taxing internet sales, Wal-Mart, casinos, ethanol subsidies, and inflation targeting.

In *Steady State Economics* 1977, Herman Daly argues that there exist logical inconsistencies between the emphasis placed on economic growth and the limited availability of natural resources.

Issues like central bank independence, central bank policies and rhetoric in central bank governors discourse or the premises of macroeconomic policies (monetary and fiscal policy) of the state, are focus of contention and criticism.

Deirdre McCloskey has argued that many empirical economic studies are poorly reported, and while her critique has been well-received, she and Stephen Ziliak argue that practice has not improved. This latter contention is controversial.

During the 2007–2012 global financial crisis, an increasing number of teachers argued that the specialized economics textbooks, some written by experts who did not see the crisis coming, were almost useless because their elaborated content was divorced from reality.

A 2002 International Monetary Fund study looked at «consensus forecasts» (the forecasts of large groups of economists) that were made in advance of 60 different national recessions in the '90s: in 97 % of the cases the economists did not predict the contraction a year in advance. On those rare occasions when economists did successfully predict recessions, they significantly underestimated their severity.

Criticisms of assumptions

Economics has been subject to criticism that it relies on unrealistic, unverifiable, or highly simplified assumptions, in some cases because these assumptions simplify the proofs of desired conclusions. Examples of such assumptions include perfect information, profit maximization and rational choices. The field of information economics includes both mathematical-economical research and also behavioral economics, akin to studies in behavioral psychology.

Nevertheless, prominent mainstream economists such as Keynes and Joskow have observed that much of economics is conceptual rather than quantitative, and difficult to model and formalize quantitatively. In a discussion on oligopoly research, Paul Joskow pointed out in 1975 that in practice, serious students of actual economies tended to use «informal models» based upon qualitative factors specific to particular industries. Joskow had a strong feeling that the important work in oligopoly was done through informal observations while formal models were «trotted out *expost*». He argued that formal models were largely not important in the empirical work, either, and that the fundamental factor behind the theory of the firm, behavior, was neglected.

In recent years, feminist critiques of neoclassical economic models gained prominence, leading to the formation of feminist economics. Contrary to common conceptions of economics as a positive and objective science, feminist economists call attention to the social construction of economics and highlight the ways in which its models and methods reflect masculine preferences.

Primary criticisms focus on failures to account for: the selfish nature of actors (*homo economicus*); exogenous tastes; the impossibility of utility comparisons; the exclusion of unpaid work; and the exclusion of class and gender considerations. Feminist economics developed to address these concerns, and the field now includes critical examinations of many areas of economics including paid and unpaid work, economic epistemology and history, globalization, household economics and the care economy. Feminists such as Marilyn Waring also argue that the discipline of economics ignores women's unpaid work and the value of nature.

Philip Mirowski observes that

The imperatives of the orthodox research programme [of economic science] leave little room for maneuver and less room for originality. ... These mandates ... Appropriate as many mathematical techniques and metaphorical expressions from contemporary respectable science, primarily physics as possible. ... Preserve to the maximum extent possible the attendant nineteenth-century overtones of «natural order» ... Deny strenuously that neoclassical theory slavishly imitates physics. ... Above all, prevent all rival research programmes from encroaching ... by ridiculing all external attempts to appropriate twentieth century physics models. ...All theorizing is [in this way] held hostage to nineteenth-century concepts of energy.

In a series of peer-reviewed journal and conference papers and books published over a period of several decades, John McMurtry has provided extensive criticism of what he terms the «unexamined assumptions and implications [of economics], and their consequent cost to people's lives». For example, he writes:

This is why we might conclude that economics ceased to be a science or an investigation once it presupposed an engineering physics model as its methodological given. It became instead the defining software of a machinal system with no place for life in its money-sequence operations. Like the received dogma of another epoch, its formulations decoupled from reality in a scholastic formalism, its priesthood would not acknowledge the right of any but trained believers to speak on issues designated by the subject, and its iron laws subsumed all that lived as material ready to be made productive by transformation into the system's service. ... Yet it would be a very great mistake to simply reject economics as a resource of analysis. It provides an articulated lexicon of exact referents, operations and principles of the global market mechanism which it presupposes as the natural order. And its resources are invaluable in coming to understand the system of rule which the global market now implements across the world in its restructuring operations. One has to expose and understand the principles the doctrine assumes in order to examine and unmask their implications for life-organization. One has to follow the assumptions its theoreticians take as given to see the trail of consequences for reality which obedience to this unseen metaphysic unleashes on the world. One

has to connect across the logical lattice of the covert value system the defining axioms and co-ordinates it bears to see what it means for the planetary life-web as an integrated whole. One has, in short, to do what the economist avoids as the explosion of his own identity – open up its value structure to examination.

Nassim Nicholas Taleb and Michael Perelman are two additional scholars who criticized conventional or mainstream economics. Taleb opposes most economic theorizing, which in his view suffers acutely from the problem of overuse of Plato's Theory of Forms, and calls for cancellation of the Nobel Memorial Prize in Economics, saying that the damage from economic theories can be devastating. Michael Perelman provides extensive criticism of economics and its assumptions in all his books (and especially his books published from 2000 to date), papers and interviews. For example, he says:

The disconnect between what purports to be objective analysis [by classical political economists] and the underlying power relationships fascinates me. Like Moliere's bourgeois gentlemen, who was unaware that he was speaking prose, economists have developed a culture in which they communicate without any recognition of how much they have internalized the distorted perspective of a capitalist system. What is more surprising is how thoroughly the economists were able to propagate their flawed worldview throughout much of society. The economic worldview loses sight of essential elements of the world economists analyze. Once their simplistic world of economics spins out of control, economists' instinct is to explain away their deficiencies rather than finally coming to grips with the real world. In that sense, I feel that a critical study of economists and their economics becomes useful as a means of self-defense against the tyranny of markets. ... In their published books, the political economists at the time ignored the injustices associated with the enforcement of the feudal game laws, as well as the enormous economic damage done by the hunters. Instead, they described the economy as the result of voluntary transactions between willing buyers and sellers. Away from the public eye, these same economists applauded the displacement of rural masses, which was providing new bodies for the emerging proletariat. In this sense, capitalism was invented as I described in [the book] *The Invention of Capitalism*. Capitalism was invented in another sense. The early economists described the emergence of capitalism as a voluntary system that benefited everybody. This falsification of history, which was central to their analysis, was a very creative invention ... In [the book] *The Invisible Handcuffs*, I tried to show how economists tried to frame capitalism as a system of voluntary transactions, as I mentioned [above]. One can understand how the economists could have gotten away with this evasion of reality in a world when literacy was limited and communications [was] expensive. In a modern world, to be able to get away with such nonsense is an audacious act of genius. Economic theory also abstracts from virtually anything having to do with time.

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